Broad**Weigh User Manual**

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Broad**Weigh**

Dynamic Wireless Load Monitoring

mantracourt

Advanced Intelligent Instrumentation

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Introduction / Overview

BroadWeigh is a portable modular wireless weighing system offering real-time load monitoring for a wide variety of rigging applications without the need for cabling.

BroadWeigh enables users to know precise loads on any given point thereby ensuring structures and rigging points are balanced and within safe working loads.

A user-friendly wireless Handheld Telemetry Display provides load monitoring of any BroadWeigh Shackle.
In addition a PC interface can be used to view and log multiple inputs on a single screen via the use of the BroadWeigh Log100 Software and USB Base Station.

Navigating This Manual

When viewing this PDF manual the following tips will help you navigate.
Viewing bookmarks (or) to the left of the page, in the PDF viewer, will allow easy navigation to the relevant chapters of this manual. Alt-left arrow is a useful shortcut back to the last page viewed after a hyperlink is clicked. Hyperlinks are coloured orange and are underlined.

Product Quick Locator

This section allows you to locate your product quickly to navigate to the correct section of the manual.

Shackles
BW-S325 BW-S475

Base Station
BW-BSue

Handheld Display
BW-HR

Relay Output
BW-RM1

Active Repeater
BW-AR

Wind Speed Sensor
BW-WSS

Power Supplies
SP1 PP1

BroadWeigh Basic Principles

There are some basic radio settings and concepts that should be understood to effectively configure, deploy, optimise and troubleshoot BroadWeigh telemetry systems.

Transmitters & Receivers

Although all of the BroadWeigh modules are in fact transceivers and transmit as well as receive, they tend to mainly operate as either a transmitter or receiver so we will choose to describe them as **Transmitters** and **Receivers**.
The BroadWeigh system was designed so that Transmitters are configured to send out messages at a user defined rate. Receivers can then use this data to analyse, display or perform other actions depending on their function.
A PC and base station are only required to configure the modules although they may be part of a data collection system. Once configured the BroadWeigh modules operate autonomously and only minimal control over the Transmitter modules is usually required, by Receiver modules, such as sleeping or waking.

Transmitters

These are the sensor modules that measure weight or wind speed etc and send messages containing the value and status information at regular intervals for use by Receiver modules or for delivering to a PC via a base station. Because these modules need to be very power efficient to operate on batteries they operate in three distinct modes. See Transmitter Module Modes of Operation later.

Receivers

These modules use messages provided by Transmitters and have functionality such as handheld displays or relay modules. These modules may also offer control over Transmitter modules such as sleeping or waking.

Radio Channel and Group Key

To be able to communicate, two radio modules must share some basic settings. There are ways to learn these and to recover unknown settings and these are discussed later in the pairing section.

Radio Channel

This is the frequency that the radio operates on. BroadWeigh radio bandwidth is divided into 15 channels. Modules must be on the same channel to be able to transfer messages.

Group Key

Group keys are a way of isolating groups of modules even if they are operating on the same radio channel. This can improve efficiency and also offer security because no radio module can affect another or see their messages unless they share the same group key.
A group key is defined by the user and is up to 15 alphanumeric characters.
Group keys were introduced in v3.0 radio firmware in June 2015. New radio modules will work with older radio modules but group keys cannot be used.

Configuring Multiple Modules to Use the Same Radio Settings

Please note that when you pair to a remote module the base station adopts the radio channel and group key of the remote module.
To set the group key for a set of remote modules you can either:

Pair to each one in turn and set their radio channel and group key

or

Configure the base station by holding the shift key and clicking the **Pair** button on the Home page. Then configure the base station to the required radio settings. Next use the tool on the radio settings advanced page to pair to each module in the set to configure their radio settings to match the base station.

ID and Data Tags

To configure a module its **ID** is used in communications. This is a unique 6 character identifier, such as **FF1234**, which is allocated at the factory. This ID is hexadecimal so can consist of numbers 0-9 and letters A-F.
If a module is a Transmitter it sends messages without broadcasting its ID. It identifies messages by using a Data Tag. This tag is a 4 character hexadecimal number and can be configured by the user. When modules leave the factory this data tag is set to the last 4 characters of its ID.
When Receiver modules or software want to use messages sent by Transmitter modules they identify the message they want by this Data Tag.
The reason Transmitter module messages are identified by a Data Tag rather than the unique ID is that this allows replacement of a Transmitter module without having to reconfigure the many Receiver modules that may be using its messages. It is only necessary to configure the replacement Transmitter module with the same data tag, radio channel and group key and the rest of the system will not notice the difference.

Transmitter Module Modes of Operation

Normal

Normal mode involves taking a reading and sending a message then entering into a very low power state before taking the next reading to maximise battery life.
Because it is not possible to communicate with the Transmitter module during this low power state a 'configuration' mode is required.

Configuration

Configuration mode forces the modules to pause in sending their messages and to disable their low power state to enable configuration to take place. This is easily achieved by '**Pairing**' when using the BroadWeigh Toolkit software. Once configuration is complete the modules will resume their '**normal**' mode operation.

Sleep

The last mode is sleep. Modules can be sent to sleep by other modules or they can go to sleep themselves when their messages are no longer being used. See **Sleep Delay Settings** later.
When sleeping, the modules can be awakened on demand by other modules or software via the base station.

Transmitter Module Sleep Delay Settings

Transmitter modules have a **Sleep Delay** setting (set in seconds) which allows the modules to go into Sleep mode when their data messages are no longer required. This allows much longer battery life to be achieved.

Setting Sleep Delay to zero disables this function in the Transmitter modules and they will only go into Sleep mode when told to do so.
Most Receiver modules and BroadWeigh software send **Stay Awake** messages when they see messages arrive from Transmitter modules. In the Transmitter modules, if the Sleep Delay time period has elapsed without a Stay Awake message arriving then the module will enter Sleep mode.
Usually the Stay Awake messages are sent every 5 seconds so Sleep Delays should be set to at least 10 seconds but can be set to anything up to an hour for situations where the Receiver is likely to be out of range for periods of time but where the Transmitter module is required to stay awake and in normal operational mode during that time. It is usual that Sleep Delays are set somewhere between 30 and 300 seconds when required.

Pairing

Because you need to know the radio settings configured in a module to be able to configure it, and there are no visible clues to what those settings may be, there is a feature used by BroadWeigh modules that enable the radio settings (i.e. the radio channel and the group key) to be determined and matched between two BroadWeigh modules.
Pairing is only required to determine and match radio settings and optionally to put BroadWeigh Transmitter modules in **configuration mode**. Because in some installations the BroadWeigh modules can be buried deep inside other equipment there had to be a way of indicating that a module has been selected to pair with without having physical access to that module. Pairing was therefore designed to be activated by removing and re-applying the module's power. In some cases this is not practical so another possible solution is Soft Pairing.

Pairing From BroadWeigh Toolkit

When using the BroadWeigh Toolkit and a base station, pairing is used to connect to a module without having to know anything about it beforehand. To pair, remove power from the required module, click a 'Pair' button in the software and re-apply power to the module. The base station and module negotiate settings and the **base station is automatically configured to match the radio settings from the module** and places the module into configuration mode. Now the module can be configured and when complete it will return to normal operational mode.

Pairing From a Receiver Module

Some Receiver modules allow pairing to a Transmitter module without requiring the BroadWeigh Toolkit. For example, the BW-HR handheld display offers this feature by turning it on while holding a certain key after which the power is applied to the Transmitter module. The radio settings are then negotiated and the **Transmitter module is automatically configured to match the handheld radio settings**. The handheld learns the ID and data tags required to be able to use messages from the Transmitter module. In this case no configuration mode is required so the Transmitter module simply continues to operate in normal mode but with altered radio settings.

Soft Pairing

Pairing by power cycling is absolute and will work under all circumstances. However, sometimes access to the power supply of a module that you want to pair to can be restricted, a module 20 meters up a tower for example, so the BroadWeigh Toolkit offers a way to *soft pair*.
To achieve this you need to know the radio channel and group key of the remote module and configure the base station to match this. You must also know the unique ID of the module and armed with this you can soft pair to the module. This works quite well with Receiver modules as they are not operating in low power modes but the software does need to try and change Transmitter modules from their normal operation mode into configuration mode.
This may not **always** work reliably in high traffic or high noise environments because there are a lot of messages that need to be sent between the base station and the remote module which can be upset by the presence of too many other messages on the same radio channel.

Configuring an Attached Base Station

Because a base station is attached to our computer when you are using the BroadWeigh Toolkit you do not pair to it the same way as with other BroadWeigh modules. To configure the base station using the Toolkit hold the shift key and click the **Pair** button on the Home page.

Asynchronous Operation and Logging

Transmitters send their messages at a fixed user defined interval regardless of whether anything is listening. This **message interval** is timed from when the Transmitter has been woken or powered on so there is no synchronisation of when the actual measurement is taken between different transmitters.
If you are logging information from multiple Transmitters using multiple channel logging software you should be aware of how the software will store and record values.
The software stores the message values as they arrive from each Transmitter and when a log is to be recorded it is the last value received by each Transmitter that is used.
This means that the values that are recorded could have been measured at any point during the Transmitter message interval.

For example, if there are 10 Transmitters operating at 1000 ms message interval then when the values are recorded to the log file you can **only** be sure that those values had been recorded within 1000 ms of each other.

So if there is a requirement that recorded sets of readings are within a certain time of each other, then that time is the maximum message interval that should be set for the Transmitters regardless of the actual log interval of the software (Which should always be greater than the Transmitter message interval).

Bandwidth

Each radio channel (1-15) has a finite ability to carry information. When modules do not need to communicate with each other they can be configured on separate radio channels and do not affect each other.
However, when multiple modules are on the same radio channel, even if they use different group keys, they are all contributing to filling the available bandwidth.
Each message transmitted takes up around 3 milliseconds so if everything worked perfectly and all modules transmitted at just the right time and with no gaps between then there could only ever be 300 messages per second being transmitted on any one radio channel.
In reality there are factors that reduce this capacity.
Each module uses a technique to detect whether anyone else is transmitting before it transmits itself and this takes a finite time. There can also be interference from other sources that can delay module transmissions.
Because of the transmission rate flexibility of the BroadWeigh modules there could be a few modules transmitting messages at fast rates or many modules transmitting messages at slow rates or any combination of these.
Practically there is a limit of around 200 messages per second available per radio channel.

It should be noted that as the number of Transmitter modules increases there is more chance of message collisions and so more messages are lost (remember that the Transmitter modules are sending their messages out at regular intervals) thus reducing the average number of messages per second arriving per module.
So, for example, 2 modules may transmit at 100 times per second or 100 modules at a rate of 1 per second.

Repeaters and Repeater Subgroups

Repeaters are able to retransmit messages so that the repeated signal is stronger than the original and so can increase the range of systems or can bypass obstacles.
The repeater must be configured to operate on the same radio channel and use the same group keys as those modules it is repeating.
Because the radio traffic is effectively doubled by a repeater there is a mechanism to reduce unnecessary repetition of messages.

Sometimes a repeater will still see messages from modules that do not need to be repeated (Thus filling up available **bandwidth**) so both repeaters and all other BroadWeigh modules have a setting called the repeater subgroup.
By default all subgroup settings are set to zero. A repeater will repeat a message from all modules whose subgroup is either zero or matches its own subgroup. If a repeater subgroup is zero it will repeat messages from all modules.
This is a simple way to break down modules into smaller groups and control what messages get repeated.
Changing the repeater subgroup is not normally necessary unless the bandwidth is very full due to either many Transmitter modules being present or very fast transmissions from modules.

BroadWeigh Toolkit

To configure the modules you must use the **BroadWeigh Toolkit** software application. This can be downloaded from our web site or may be shipped with your products.
The software is suitable for all versions of Windows.
Run setup.exe and follow the prompts to install the software.

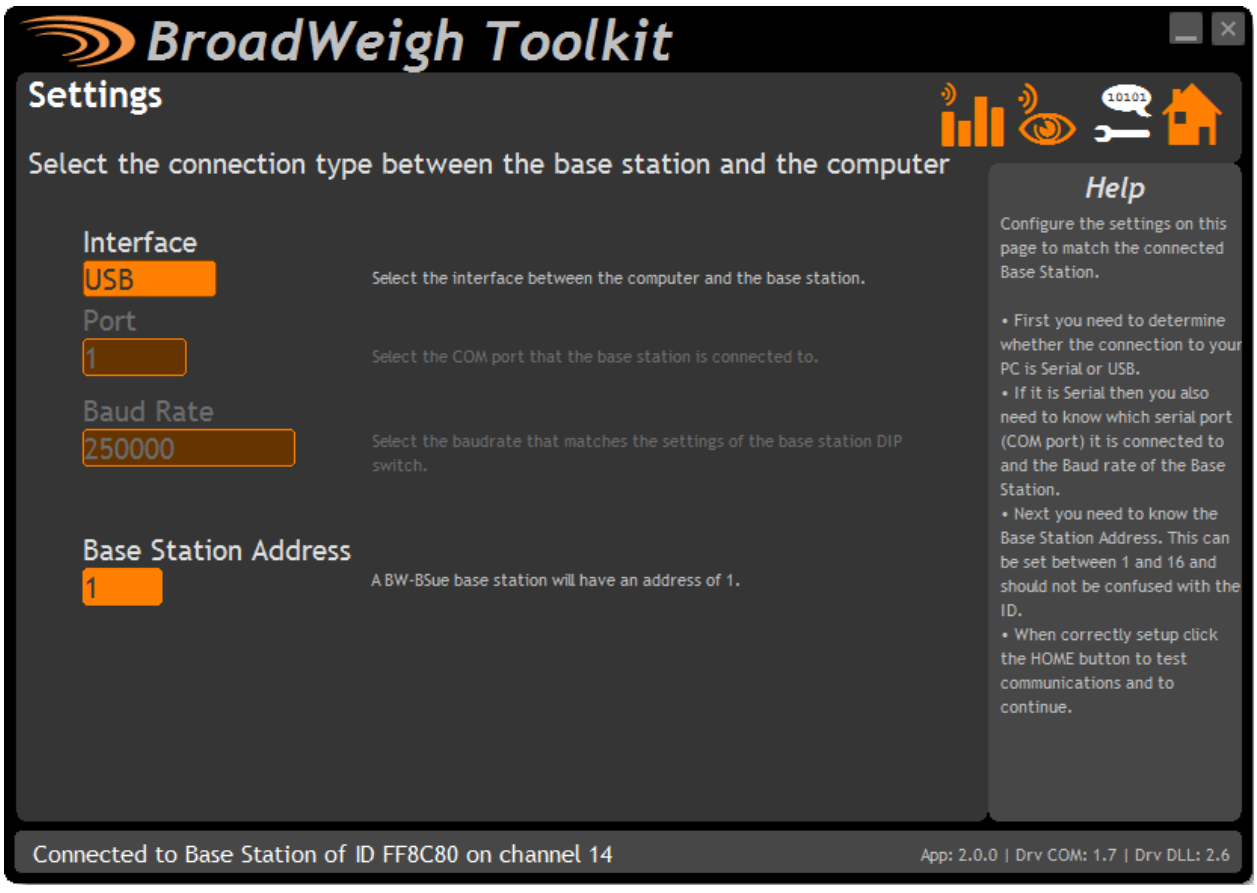
In the Toolkit all items that can be changed or interacted with by the user are coloured orange.
To change a value just click on the relevant orange item. You will then be presented with a new dialog window allowing you to change the value.
This may use a slider, text box or list to allow your new value to be entered.

A base station will also be required to configure the BroadWeigh modules. You just need to plug this into a USB socket on your PC.

Common Toolkit Pages

These pages in the BroadWeigh Toolkit are applicable to all connected modules.

Setup Base Station Communications

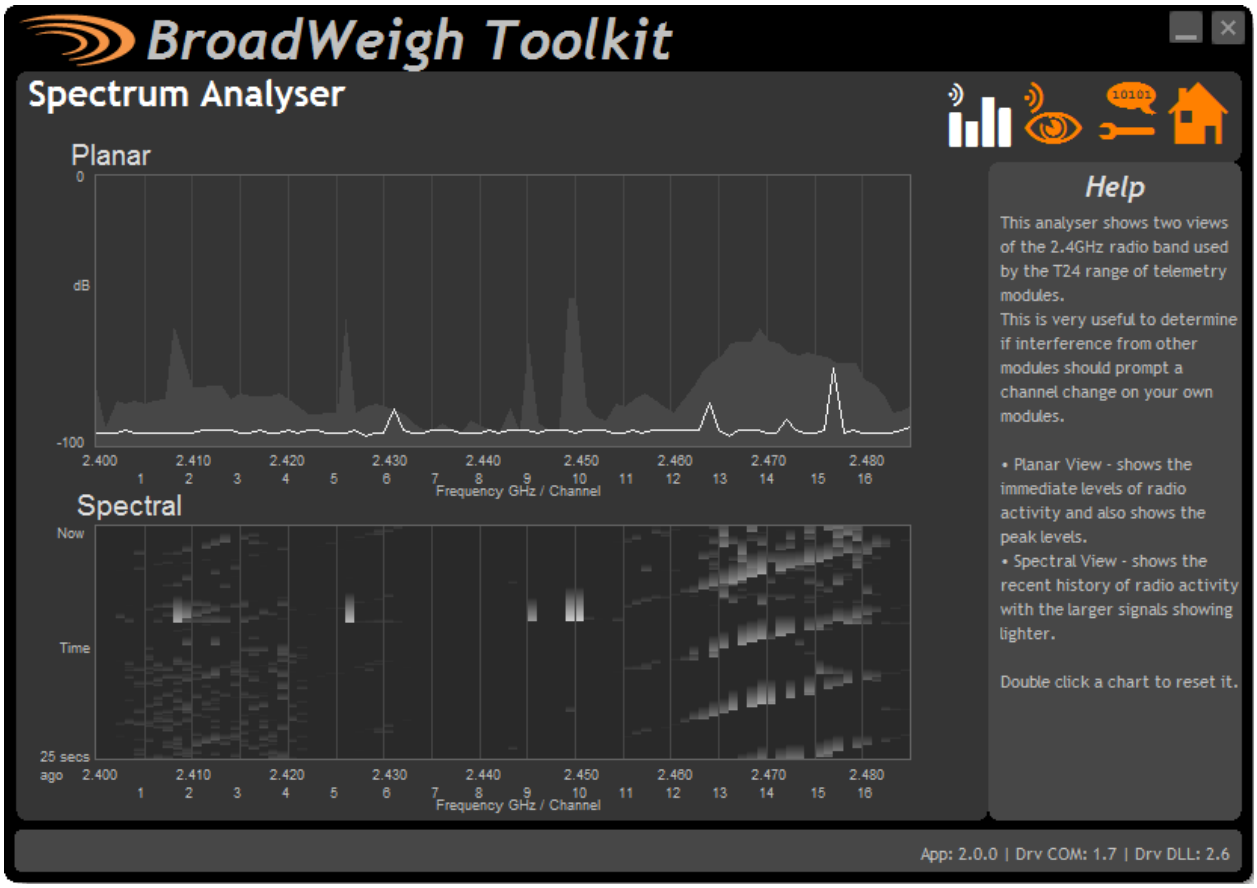

BroadWeigh Toolkit
Settings
Select the connection type between the base station and the computer
Interface
USB
Select the interface between the computer and the base station.
Port
1
Select the COM port that the base station is connected to.
Baud Rate
250000
Select the baudrate that matches the settings of the base station DIP switch.
Base Station Address
1
A BW-BSue base station will have an address of 1.
Help
Configure the settings on this page to match the connected Base Station.
• First you need to determine whether the connection to your PC is Serial or USB.
• If it is Serial then you also need to know which serial port (COM port) it is connected to and the Baud rate of the Base Station.
• Next you need to know the Base Station Address. This can be set between 1 and 16 and should not be confused with the ID.
• When correctly setup click the HOME button to test communications and to continue.
Connected to Base Station of ID FF8C80 on channel 14
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Select the appropriate interface type for the connected base station. This will usually be USB. If the base station is connected via a serial port then you will need to know the COM port it is connected to and the baud rate.
The Base Station Address is usually 1. This will only ever be different if it has been changed on base stations to support multi base station configurations.

Click the Home button to attempt communications with the base station.

If no communications can be established the toolkit will remain on this page. You will need to check that the base station is powered and that it is connected to any converters correctly.

Analyser


BroadWeigh Toolkit
Spectrum Analyser
Planar
0
dB
-100
2.400 2.410 2.420 2.430 2.440 2.450 2.460 2.470 2.480
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Frequency GHz / Channel
Spectral
Now
Time
25 secs ago
2.400 2.410 2.420 2.430 2.440 2.450 2.460 2.470 2.480
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Frequency GHz / Channel
Help
This analyser shows two views of the 2.4GHz radio band used by the T24 range of telemetry modules.
This is very useful to determine if interference from other modules should prompt a channel change on your own modules.
• Planar View - shows the immediate levels of radio activity and also shows the peak levels.
• Spectral View - shows the recent history of radio activity with the larger signals showing lighter.
Double click a chart to reset it.
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

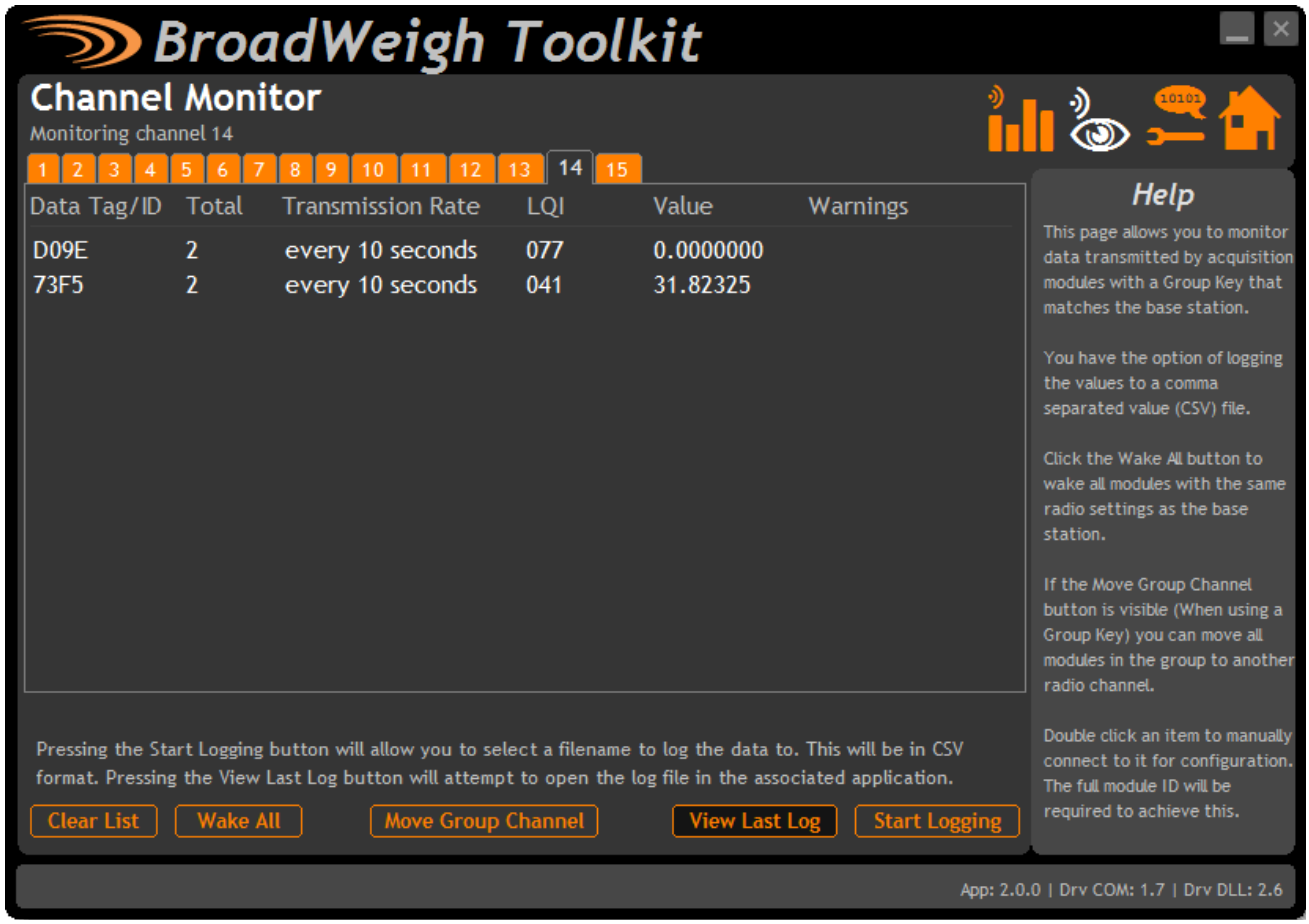
The analyser page is provided as a tool and will not normally be needed unless you plan to change channels and want to find the best channel to select, or to diagnose poor communications issues.

This page shows the radio signal levels detected across all the channels available to the BroadWeigh series of modules. Using this tool may help in detecting noisy areas and allow you to decide on which channels you may want to use.

The above charts show the traffic from a Wi-Fi network that can be seen to be operating over channels 12 to 16 and it would be best (though not essential) to avoid using these channels.

Although 16 channels are shown the BroadWeigh modules operate over radio channels 1 to 15.

Channel Monitor


BroadWeigh Toolkit
Channel Monitor
Monitoring channel 14
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Data Tag/ID Total Transmission Rate LQI Value Warnings
D09E 2 every 10 seconds 077 0.0000000
73F5 2 every 10 seconds 041 31.82325
Help
This page allows you to monitor data transmitted by acquisition modules with a Group Key that matches the base station.
You have the option of logging the values to a comma separated value (CSV) file.
Click the Wake All button to wake all modules with the same radio settings as the base station.
If the Move Group Channel button is visible (When using a Group Key) you can move all modules in the group to another radio channel.
Double click an item to manually connect to it for configuration. The full module ID will be required to achieve this.
Pressing the Start Logging button will allow you to select a filename to log the data to. This will be in CSV format. Pressing the View Last Log button will attempt to open the log file in the associated application.
Clear List
Wake All
Move Group Channel
View Last Log
Start Logging
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

This page shows a summary of data sent by transmitter modules.
You can see the Data Tag of transmitted messages along with the total number of messages received, the transmission rate, link quality, data value and any error messages.
Base stations built after June 2015 can also list modules that are sleeping. These will show an ID instead of a Data Tag.

> To see any data the base station must be on the **same** radio channel as the transmitters and must have a **matching** Group Key

The radio channel of the base station can be changed by clicking the channel tabs along the top of the page.

If you want to change the Group Key of the attached base station you need to configure its radio settings. See Configure Base Station

Items you can change or interact with:

Radio Channel Tabs	Click a tab to change the radio channel the base station is operating on
Clear List	Clear all detected messages from the list
Wake All	Wake all modules on the current radio channel

Start Logging	Asks for a filename then logs the received data to a CSV file in the following format: `Data Tag, Elasped ms, Value`
View Last Log	Will launch the application associated with CSV files and open the last logged file.
Move Group Channel	If the base station has a group key set then this button will be visible. Once at least one module is present in the list this button will become enabled. Clicking it will ask the user for a new radio channel then all detected transmitters, along with any other modules on the same channel such as handhelds, will all be moved to the selected channel. Once this has been achieved the base station itself will move and the list will start to fill again with messages on the new radio channel.

> To enable non transmitter modules to be moved to the new channel they should be powered up and operational at the time the button is pressed.

Home

BroadWeigh Toolkit
Home
Monitor or Log
You can view and log the data being transmitted from an acquisition module or view the spectrum analyser by clicking the icons above right. Pairing is NOT required to log data from your device.
Configure your device
To configure your module we need to temporarily pair to it. When we pair from the Toolkit we configure the base station radio settings to match the remote module.
To pair you must:
· Remove the power from your module.
· Initiate the pair by clicking the button below.
· Re-apply the power to the module.
When applying power be careful to do this cleanly because if the module is powered up with an intermittent connection it may reset during pairing and result in poor or no communications.
Pair
If the module cannot be paired because access to the power supply is either not possible or many modules share the same power supply. Click Here for manual connection.
Help
This Home page is where you begin your connection to your module.
You must be able to access its power supply so you can remove and reapply it.
The module you want to connect to must be the only module you re-apply power to.
When pairing to a module the base station radio settings are changed to match those of the remote module.
[To connect to the base station hold the Shift key while clicking the Pair button]
Connected to Base Station of ID FF8C80 on channel 14
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

You now have successful communications with the base station so you can now pair with our remote BroadWeigh module or you can select the Spectrum Analyser mode or Data Provider Monitor mode.

Connecting to a remote module

To connect to a remote module you will pair. This is achieved by power cycling the module. Pairing removes the need to know the radio settings of the module you are connecting to and also ensures that it is in a suitable state for configuration.

Pairing Procedure

- Remove power from the BroadWeigh module.
- Click the Pair button on the Toolkit.
- Re-apply power to the BroadWeigh module within 10 seconds.

When you connect successfully the Toolkit will change to the Information page. If the pairing fails try again.

Pairing with the toolkit will **not** change the radio configuration settings of the connected module. The base station radio settings will be changed to match those of the remote module.

When the toolkit connects to a remote module to enable configuration it will usually inhibit the normal operational transmission of messages

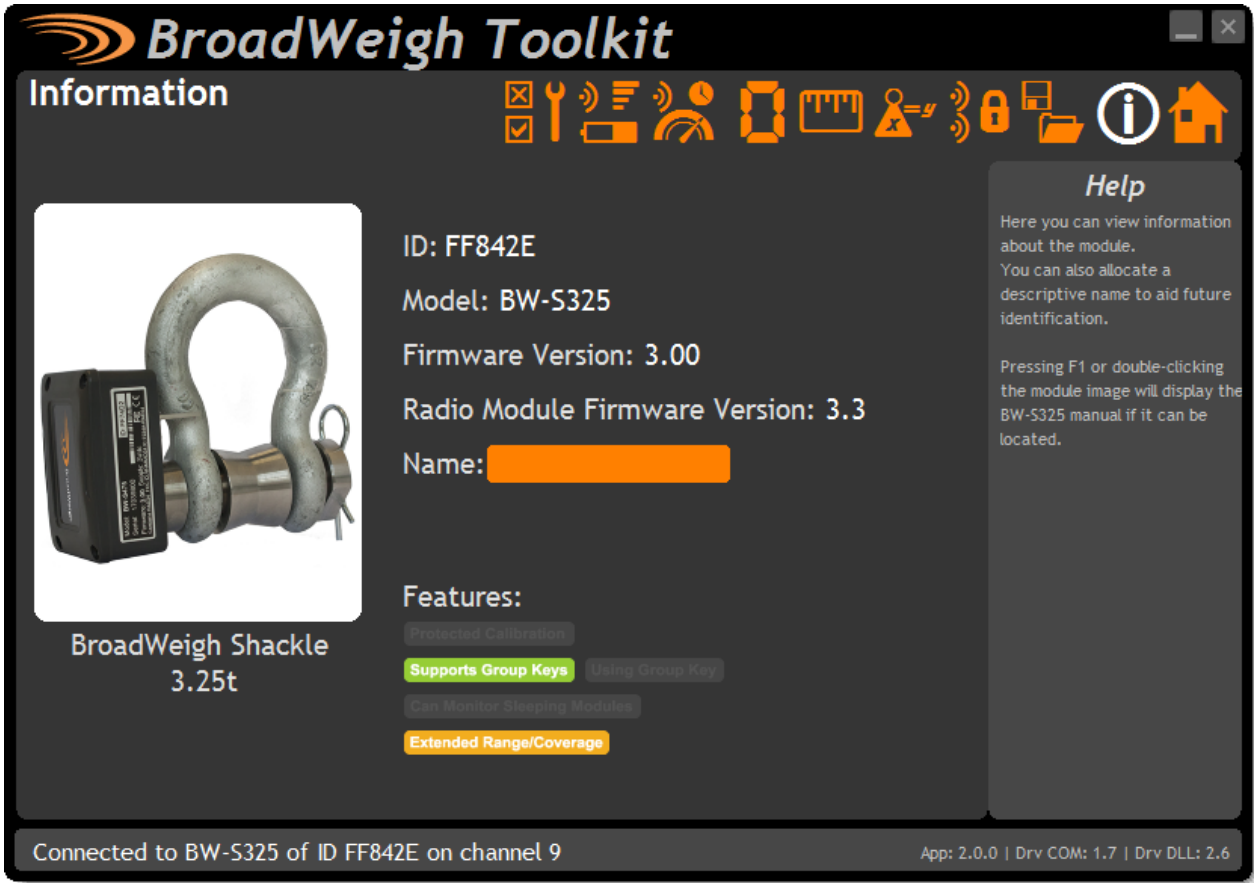
Connecting to the attached base station module

To pair to and configure the connected base station, hold the shift key and click the Pair button.

Manual Connection

If you cannot get to the power supply of the remote module you can attempt to connect manually using Soft Pairing. Click the 'Click Here' link at the bottom of the page and follow the prompts.

Information


BroadWeigh Toolkit
Information
Help
Here you can view information about the module.
You can also allocate a descriptive name to aid future identification.
Pressing F1 or double-clicking the module image will display the BW-S325 manual if it can be located.
ID: FF842E
Model: BW-S325
Firmware Version: 3.00
Radio Module Firmware Version: 3.3
Name:
Features:
Protected Calibration
Supports Group Keys
Using Group Key
Can Monitor Sleeping Modules
Extended Range/Coverage
BroadWeigh Shackle
3.25t
Connected to BW-S325 of ID FF842E on channel 9
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Once successfully paired to a module this page is displayed showing us information about the connected module.

Items you can change:

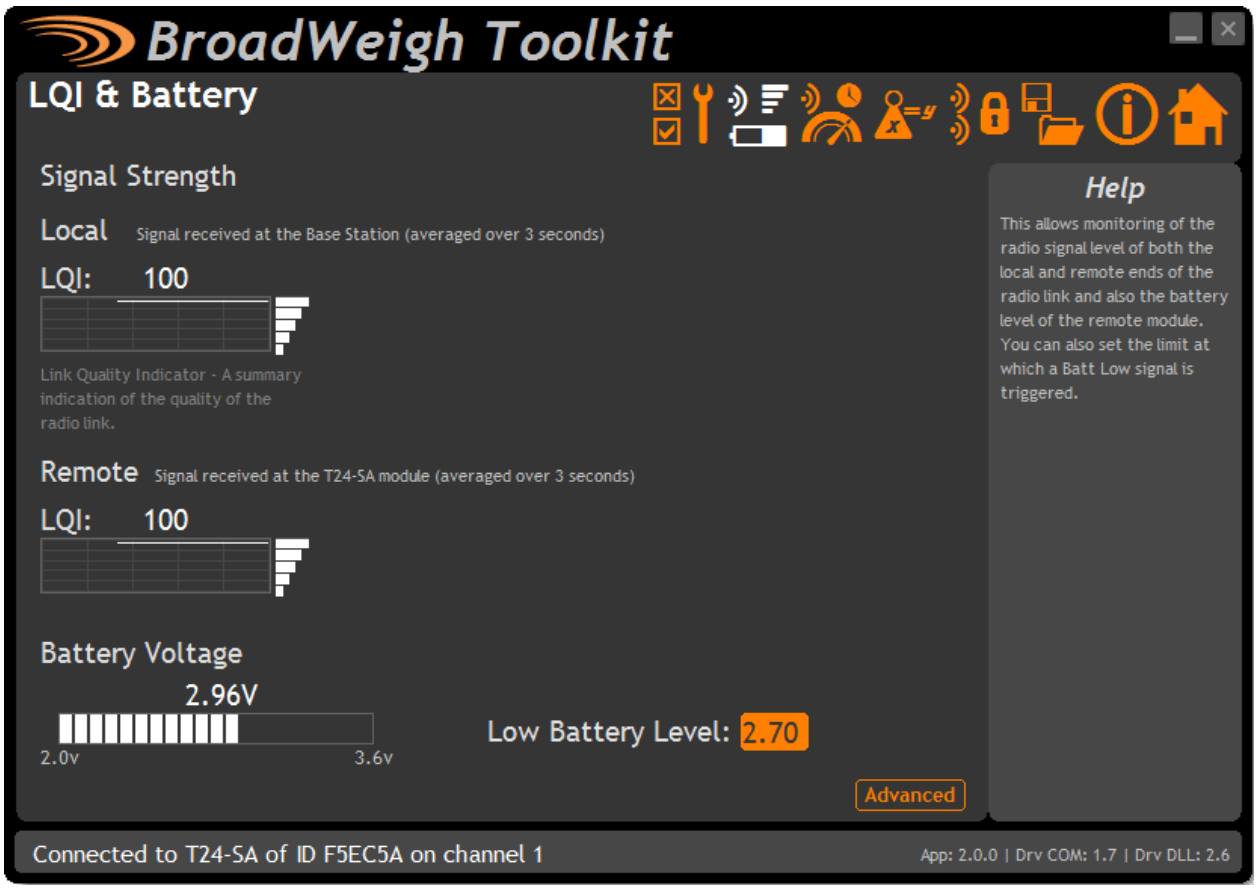
Name	You can enter a short description which may help us recognise this module in the future.

Features

Each module may support certain features which are indicated on this page. If the feature is greyed out then it is not supported. If it is coloured then it is supported.

Protected Calibration	Some transmitter modules may have had their calibration protected. This indicates that you cannot calibrate this module.
Supports Group Keys	Group Keys were introduced in 2015 so modules built before this date will not support this feature. This indicates that the connected module can support them
Using Group Key	This indicates that the connected module can support Group Keys and that one has been configured for this module
Can Monitor Sleeping Modules	Applicable to a base station only. This indicates that on the Channel Monitor page modules that are sleeping will also be listed
Extended Range/Coverage	Extended range radios were introduced to the BroadWeigh range in 2015. This indicates that the connected module has an extended range radio fitted.

Battery and Radio Levels


BroadWeigh Toolkit
LQI & Battery
Signal Strength
Local
Signal received at the Base Station (averaged over 3 seconds)
LQI: 100
Link Quality Indicator - A summary indication of the quality of the radio link.
Remote
Signal received at the T24-SA module (averaged over 3 seconds)
LQI: 100
Battery Voltage
2.96V
2.0v
3.6v
Low Battery Level: 2.70
Advanced
Help
This allows monitoring of the radio signal level of both the local and remote ends of the radio link and also the battery level of the remote module. You can also set the limit at which a Batt Low signal is triggered.
Connected to T24-SA of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

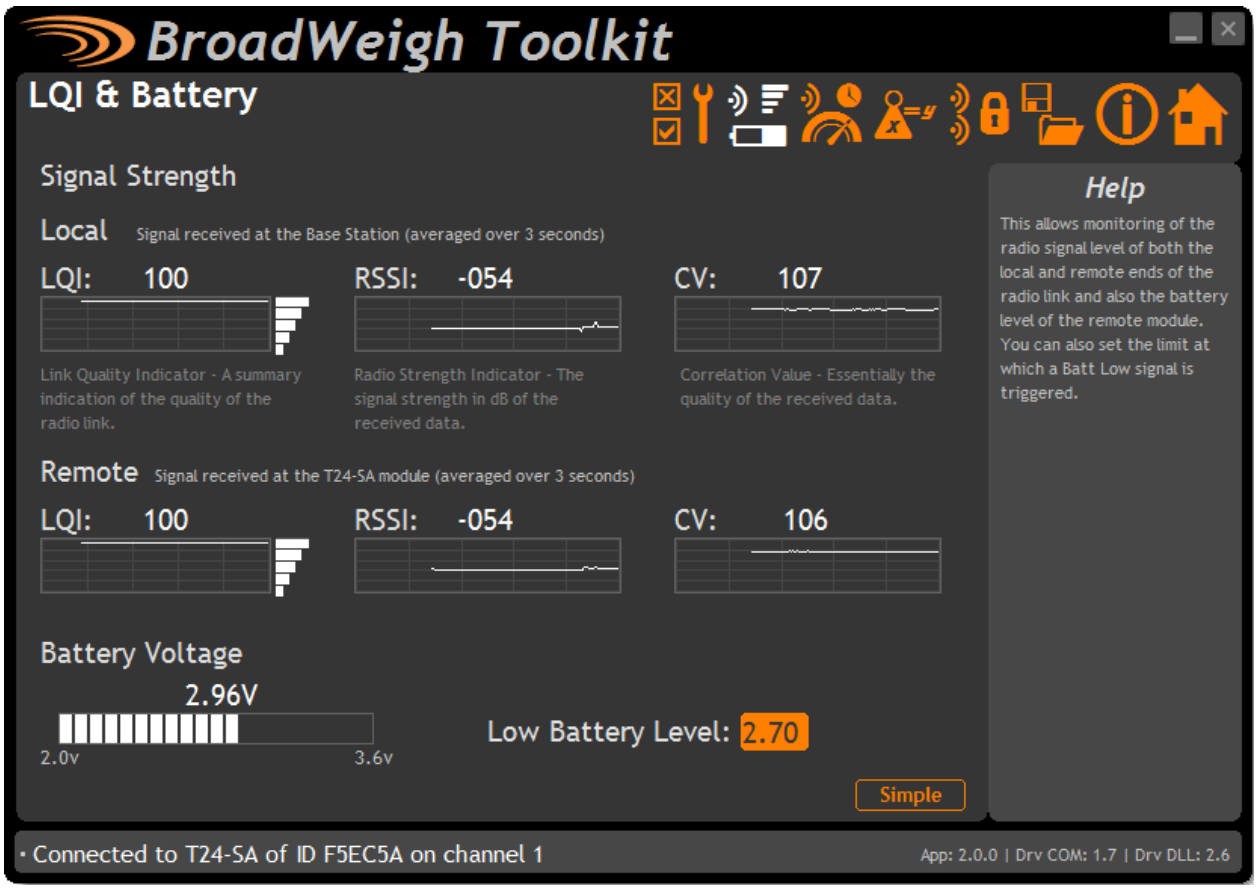
Here you can see the voltage of the battery and the radio signal levels at the base station and the remote transmitter module. This simple view gives an LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and anywhere within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable.

On modules that are battery powered the battery voltage section will be visible. You can set the level at which the transmitter module reports a low battery. (At 2.1 V the module will stop working)
If the battery voltage is below the Low Battery Level the bar will be coloured orange.

Items you can change:

Low Battery Level	Click this item to set the battery low level.
Advanced Button	Clicking this will give more detailed information on the RSSI and CV levels of the received radio packets.

Battery and Radio Levels Advanced

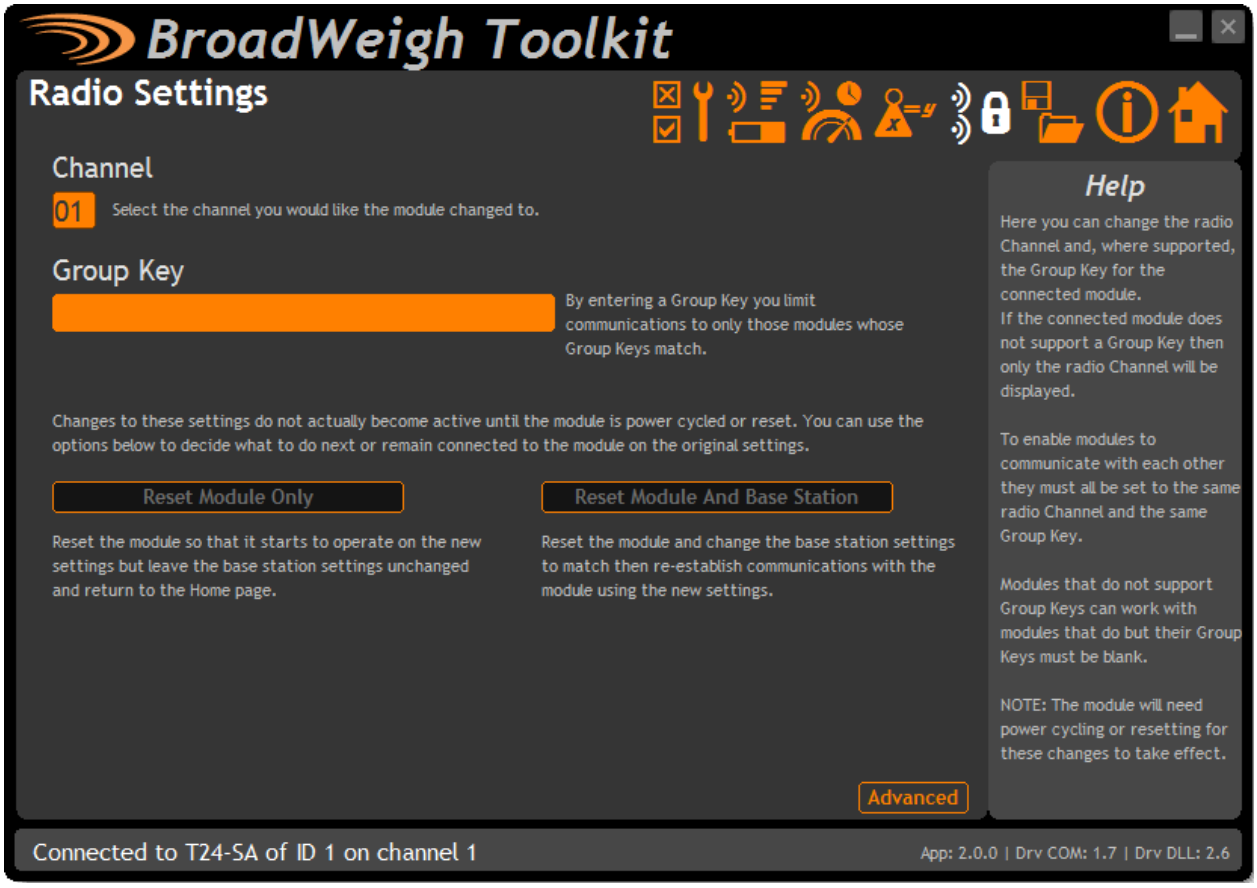

BroadWeigh Toolkit
LQI & Battery
Signal Strength
Local
Signal received at the Base Station (averaged over 3 seconds)
LQI: 100
RSSI: -054
CV: 107
Link Quality Indicator - A summary indication of the quality of the radio link.
Radio Strength Indicator - The signal strength in dB of the received data.
Correlation Value - Essentially the quality of the received data.
Remote
Signal received at the T24-SA module (averaged over 3 seconds)
LQI: 100
RSSI: -054
CV: 106
Battery Voltage
2.96V
2.0v
3.6v
Low Battery Level: 2.70
Simple
Help
This allows monitoring of the radio signal level of both the local and remote ends of the radio link and also the battery level of the remote module. You can also set the limit at which a Batt Low signal is triggered.
Connected to T24-SA of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable. The LQI value is derived from the RSSI and CV values.

RSSI is the Radio Signal Strength Indicator and indicates the received dB level which will range from about -30 which is a good signal to -98 which is a weak signal.

CV is the Correlation Value and indicates how well the signal can be decoded. This ranges from 55 which is a poor quality signal and 110 which is an excellent signal.

Radio Settings


BroadWeigh Toolkit
Radio Settings
Channel
01
Select the channel you would like the module changed to.
Group Key
By entering a Group Key you limit communications to only those modules whose Group Keys match.
Changes to these settings do not actually become active until the module is power cycled or reset. You can use the options below to decide what to do next or remain connected to the module on the original settings.
Reset Module Only
Reset the module so that it starts to operate on the new settings but leave the base station settings unchanged and return to the Home page.
Reset Module And Base Station
Reset the module and change the base station settings to match then re-establish communications with the module using the new settings.
Advanced
Help
Here you can change the radio Channel and, where supported, the Group Key for the connected module.
If the connected module does not support a Group Key then only the radio Channel will be displayed.
To enable modules to communicate with each other they must all be set to the same radio Channel and the same Group Key.
Modules that do not support Group Keys can work with modules that do but their Group Keys must be blank.
NOTE: The module will need power cycling or resetting for these changes to take effect.
Connected to T24-SA of ID 1 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change the channel and group key for the connected module.

Items you can change:

Channel

Select a radio channel between 1 and 15. The default is channel 1. You can use the Spectrum Analyser mode to determine a good clean channel to use.

Group Key

Only visible on modules that support Group Keys.
Only modules with identical group keys can communicate. This allows isolation of different groups of modules on the same channel or ensures the security of data. Early versions of BroadWeigh modules do not support Group Keys and this option will not be visible in the Toolkit.
To use modules that support Group Keys with older modules that do not then the Group Keys must be blank.

The following two options are not visible when changing radio settings for a base station. In that case changes are immediate.

Reset Module Only

Only enabled once a change has been made.
When radio settings are changed they do not take effect immediately but require a reset or power cycle. This button forces the connected module to adopt the new settings but keeps the base station on the existing settings. The home page is then shown.

Reset Module and base Station

Only enabled once a change has been made.
When radio settings are changed they do not take effect immediately but require a reset or power cycle. This button forces both the connected module and the base station to adopt the new changes and re-establishes a connection.

Radio Settings Advanced

BroadWeigh Toolkit
Radio Settings Advanced
Repeater Subgroup
Refer to the repeater user manual for information about this setting. Do not change this unless you understand the effect that the changes will have.
0
Select subgroup 0 - 3. A repeater will repeat data from all T24 modules (with the same radio settings) that it receives data from where the module repeater subgroup (set here) is set to zero or matches the repeater subgroup set in the repeater.
Help
This advanced page allows you to quickly change radio settings of multiple modules to match those of the connected base station.
Remote Module Radio Settings Tool
Channel: 01
Group Key:
If you want to change the radio settings of multiple remote modules to match the current base station settings (Shown above) you can do so by clicking the link below. You can do this regardless of what module you are currently paired with.
Click Here and then activate the pairing function of the desired module.
Back
Connected to T24-SA of ID 1 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change the repeater subgroup settings for the connected module. Also a tool is provided to quickly match remote module radio settings to the base station radio settings.

Items you can change:

Repeater Subgroup	Select a repeater subgroup for this module. The default is zero which will let all repeaters repeat messages from this module. See Repeaters and repeater Subgroups
Remote Module Radio Settings Tool	To quickly set a batch of remote modules to match the radio settings of the base station you can use this tool. Usually this is arrived at by pairing with the base station by holding the shift key whilst clicking the Pair button on the Home page. To change the remote module radio settings: • Remove remote module power • Click the 'Click Here' link on the page • Apply power to the remote module The Toolkit will remain unchanged and still paired to whatever module or base station it was paired to but the remote module will have changed its radio settings.

Save and Restore

BroadWeigh Toolkit
Save and Restore
Save
Query the device for its parameters and save these to a configuration file on your computer or network location.
Restore
Load a previously saved configuration file into the currently connected device.
Help
This page allows you to save the configuration of the connected module to a disk file on your computer.
This file may then be used to restore the configuration to the same module or to clone the configuration onto another module.
Connected to T24-SA of ID 1 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can save the module settings to a file on your PC so that they can be later loaded back into the same or different module.

Items you can change:

Save	Click this button to open a file dialog window to allow you to select a filename and location to save the configuration file to. All configuration information including calibration data will be saved to the file. The file extension is **tcf**.
Restore	Click this button to open a file dialog window to allow you to select a filename and location of a previously saved file to load into the connected module. All configuration information will be overwritten. The file extension is **tcf**.

Transmitter Modules

BroadWeigh Transmitters are the modules that connect to a sensor or have an input signal applied and periodically transmit messages containing the value read from the sensor or input. These modules include shackle load cell transmitters and wind speed sensor transmitters.

BW-S325, BW-S475

Overview

The BroadWeigh Shackle is a Crosby safety bow shackle with integrated electronics which features the following:

- Available in 4 ¾ tonne or 3 ¼ tonne options
- Up to 800 m line of sight wireless transmission range
- Fully weatherised (IP67)
- 5:1 safety factor
- Low rigging profile of 130 mm
- 2000 hr battery life at transmission 1 per second
- Sleep function to preserve battery life when not needed
- Accuracy of ±1% of current load or 25 kg, whichever is the greater value

Order Codes

BW-S325

Load shackle with SWL of 3.25 tonnes.

BW-S475

Shackle capable of measuring up to 4.75 tonnes.

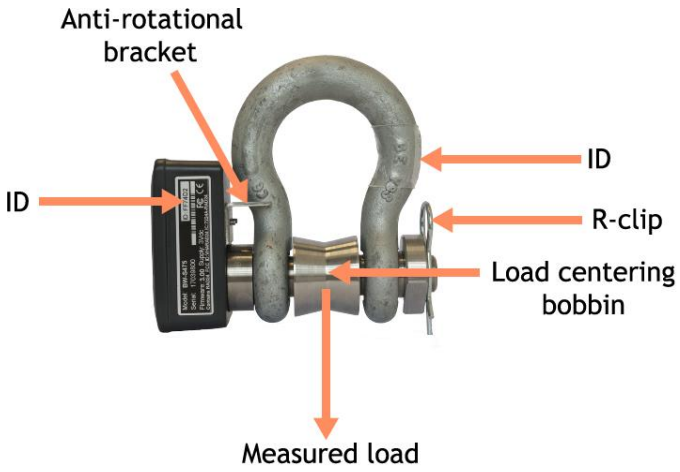
Orientation & Identification

The shackle pin and bow are calibrated and load tested together. It is therefore essential for the accuracy of the system that the following information is adhered to:

Each pin and bow **must** be kept as a pair and not interchanged. The bow is marked with the ID of the pin it is associated with as shown.

The pin **must** be aligned in the same orientation with the bow as it was when calibrated. The BroadWeigh shackle is designed to only fit together in one orientation, the anti-rotational bracket will only fit around the bow shackle on the side with CE marking. This is the opposite side to the ID marking.

The shackle **must** be used in conjunction with a bobbin, nut and retaining clip as shown:



The BroadWeigh Shackle is a sensitive measuring device calibrated to ensure accuracy and reliability.
Care must be taken during use, transportation and storage to avoid unnecessary mechanical damage.

To ensure accuracy, load must be applied vertically through the pin and the load must be centralised with a bobbin.

Connections

Connecting Power.

To ensure optimum battery life, only quality alkaline batteries are recommended.

> Rechargeable batteries are not suitable.

Remove the four screws. Insert two alkaline 1.5 V AA batteries. Refit the lid.

Configuration

The BroadWeigh Toolkit provides a means of simple configuration and calibration of the shackle along with useful tools to aid integration.

Launch the BroadWeigh Toolkit software application and pair to this module to enable the connection to the Toolkit to allow configuration to take place. See Common Toolkit Pages - Home

Units

BroadWeigh Toolkit
Units
Output Units
kg
Select the required engineering units for transmission. If you change the units you should also check that the Zero Indication Band is also set correctly.
Output Value
2.639976
Help
This page allows you to scale the displayed data and to alter the update rate of the LCD display.
Connected to BW-S475 of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Use this page to select the Output units of the Paired BroadWeigh Shackle.

Parameters:

Output Units — Use the drop down box to select between kg, lbs, tonnes, ton, ton (US) & kN.

If these units are changed ensure the Zero Indication Band is also set correctly.

Zero Settings

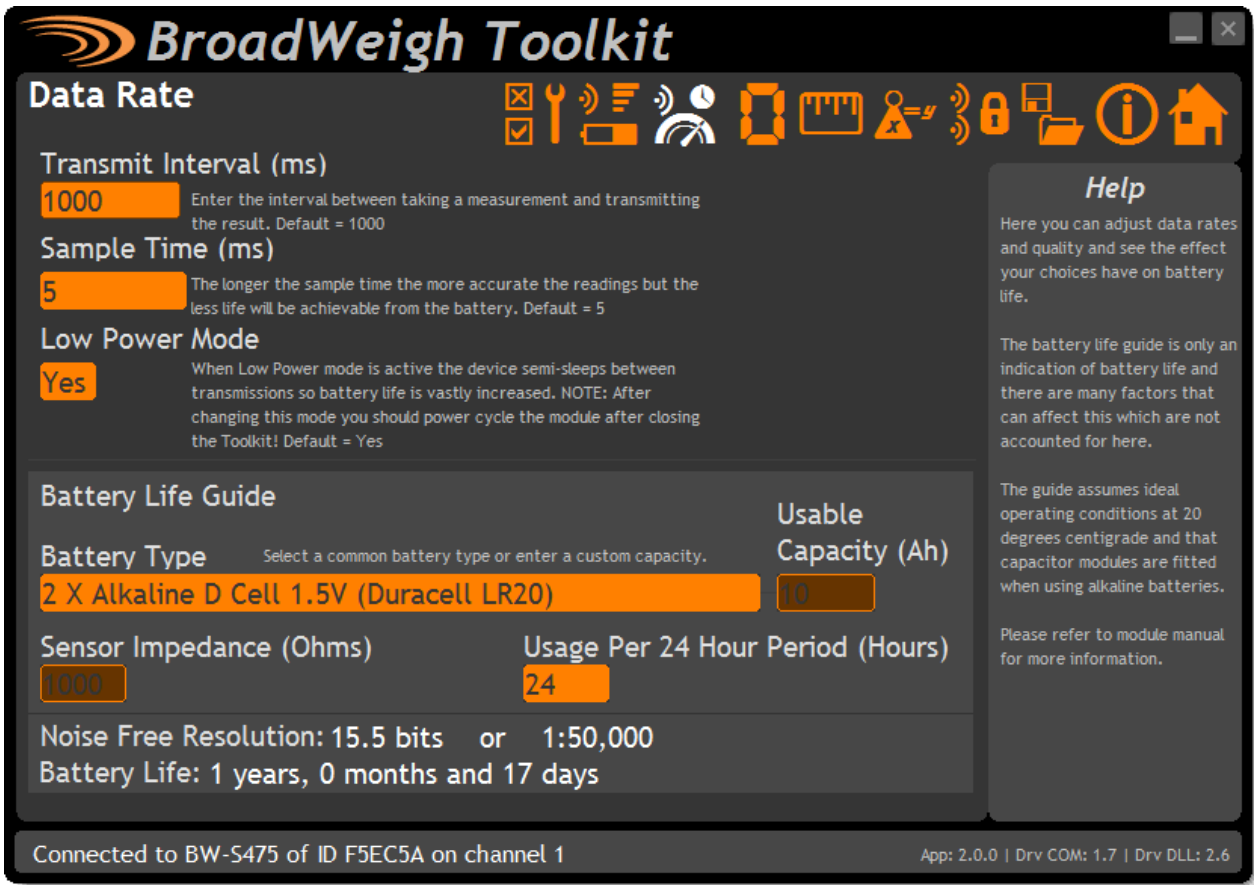
BroadWeigh Toolkit
Zero Settings
Zero Indication Band
1.0
kg
This setting enables you to hide small values of weight so that any displays based on the output from this module will display zero until a certain weight has been reached. You can enter a value here that represents a ± band around zero so that if the value to be transmitted is within this band a zero will be transmitted. Once the weight exceeds this band the real weight will be transmitted.
System Zero
This allows you to zero the output value or remove existing system zero.
Zero Now
Remove Zero
There is a limit of 100.00 kg that can be zeroed.
Ensure that there is no load on the schackle when you click the Zero Now button.
Output Value
0
Help
Adjust the zero indication band and perform system zero.
Connected to BW-S325 of ID FF8426 on channel 15
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Use this page to perform system zero and to hide small values of weight (masking) for the paired BroadWeigh Shackle

Parameters:

Zero Indication Band	This setting enables you to hide small values of weight so that any displays based on the output from this module will display zero until a certain weight has been reached. You can enter a value here that represents a ± band around zero so that if the value to be transmitted is within this band a zero will be transmitted. Once the weight exceeds this band the full weight will be transmitted. For example: A BroadWeigh Shackle with a 5.0 kg Zero Indication Band will only transmit a zero value until 5 kg of weight or more is applied when it will then transmit the applied weight value. **If you change the module units you will need to adjust the zero indication band again.**
System Zero	If the unloaded shackle is displaying a small weight you can re-zero the output value by applying a system zero**.** **Remove the load from the shackle before clicking the 'Zero Now' button.**
Output Value	This shows the weight value that will be transmitted and shows the effect of the system zero and the zero indication band.

Data Rates and Quality


BroadWeigh Toolkit
Data Rate
Transmit Interval (ms)
1000
Enter the interval between taking a measurement and transmitting the result. Default = 1000
Sample Time (ms)
5
The longer the sample time the more accurate the readings but the less life will be achievable from the battery. Default = 5
Low Power Mode
Yes
When Low Power mode is active the device semi-sleeps between transmissions so battery life is vastly increased. NOTE: After changing this mode you should power cycle the module after closing the Toolkit! Default = Yes
Help
Here you can adjust data rates and quality and see the effect your choices have on battery life.
The battery life guide is only an indication of battery life and there are many factors that can affect this which are not accounted for here.
The guide assumes ideal operating conditions at 20 degrees centigrade and that capacitor modules are fitted when using alkaline batteries.
Please refer to module manual for more information.
Battery Life Guide
Battery Type
Select a common battery type or enter a custom capacity.
2 X Alkaline D Cell 1.5V (Duracell LR20)
Usable Capacity (Ah)
0
Sensor Impedance (Ohms)
1000
Usage Per 24 Hour Period (Hours)
24
Noise Free Resolution: 15.5 bits or 1:50,000
Battery Life: 1 years, 0 months and 17 days
Connected to BW-S475 of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Use this page to select the rate at which data is transmitted from the acquisition module and the quality. By selecting low power mode and entering some other information the toolkit will also give guides on achievable battery life.
Note that the battery life calculator assumes a 20°C ambient temperature. To ensure optimum battery life, only quality alkaline batteries are recommended. *Rechargeable batteries are not suitable.*

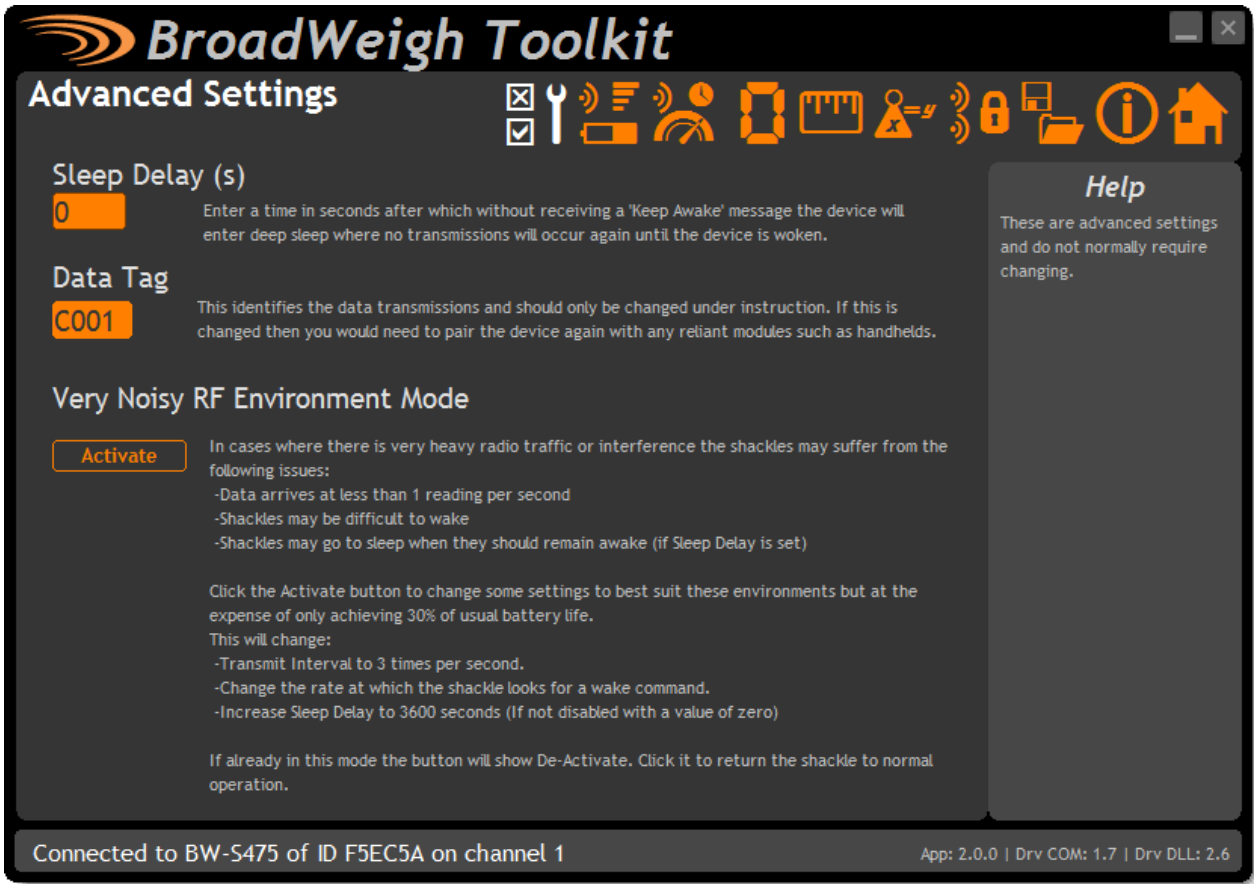
Parameters:

Transmit Interval	Enter the transmission rate in milliseconds. The default is 1000 ms for BroadWeigh Shackles. Longer battery life will be achieved with less frequent transmissions.
Sample Time	This is the length of time in milliseconds that the input is sampled before the value is transmitted. This can vary between 5 ms and close to the Transmit Interval. A shorter sample time means that the device is awake for less time so battery life is increased but at the expense of a reading with less noise free resolution. Alter this to see the effect on battery life and noise free resolution.
Low Power Mode	Low power mode is the usual mode of operation and increases battery life. If the transmission interval were increased above 25 Hz (40 ms transmit interval) then low power mode would need to be turned off.

Continued...

Battery Type	This is not a parameter of the device but information used by the battery life guide. Choose from some pre-set battery parameters or choose custom and select chosen battery capacity. See below. This will also offer to change the Battery Low Level if the level suitable for the chosen battery is not the level currently set.
Usable Capacity	This is not a parameter of the device but information used by the battery life guide. This is the capacity of the battery in amp hours and has a profound effect on battery life calculations. This capacity needs to be calculated from battery manufacturer's data sheets to take into account that you can only use batteries down to 2.1 volts so in the case of twin AA cells this would be 1.05 volts. Generally the usable capacity will not be as high as that advertised by the battery manufacturer. Temperature and internal resistance of the battery are not taken into account in the guide.
Sensor Resistance	This is fixed at 1000 ohms.
Usage Per 24 Hour Period	In order to calculate battery life, enter the number of hours per 24-hour period that the BroadWeigh Shackle will be connected to a BroadWeigh USB base station or Handheld remote

Advanced Settings


BroadWeigh Toolkit
Advanced Settings
Sleep Delay (s)
0
Enter a time in seconds after which without receiving a 'Keep Awake' message the device will enter deep sleep where no transmissions will occur again until the device is woken.
Data Tag
C001
This identifies the data transmissions and should only be changed under instruction. If this is changed then you would need to pair the device again with any reliant modules such as handhelds.
Very Noisy RF Environment Mode
Activate
In cases where there is very heavy radio traffic or interference the shackles may suffer from the following issues:
-Data arrives at less than 1 reading per second
-Shackles may be difficult to wake
-Shackles may go to sleep when they should remain awake (if Sleep Delay is set)
Click the Activate button to change some settings to best suit these environments but at the expense of only achieving 30% of usual battery life.
This will change:
-Transmit Interval to 3 times per second.
-Change the rate at which the shackle looks for a wake command.
-Increase Sleep Delay to 3600 seconds (If not disabled with a value of zero)
If already in this mode the button will show De-Activate. Click it to return the shackle to normal operation.
Help
These are advanced settings and do not normally require changing.
Connected to BW-S475 of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

It should not normally be necessary to change these settings.

Parameters:

Sleep Delay

Enter a delay in seconds after which the BroadWeigh Device will return to deep sleep if no Keep Awake message is heard from the handheld or base station. The default is 60 seconds.

> If a value of 0 is used the shackle will not enter into low power state and battery life could be compromised if no other device sends the shackle to sleep.

Data Tag

The data transmitted by the BroadWeigh Shackle is marked with a Data Tag. By default this is set to the last 4 characters of the device ID. The BroadWeigh Shackle Data Tag can be changed to an easily remembered 4 digit code to reflect its position within your system. For example '00A1'.

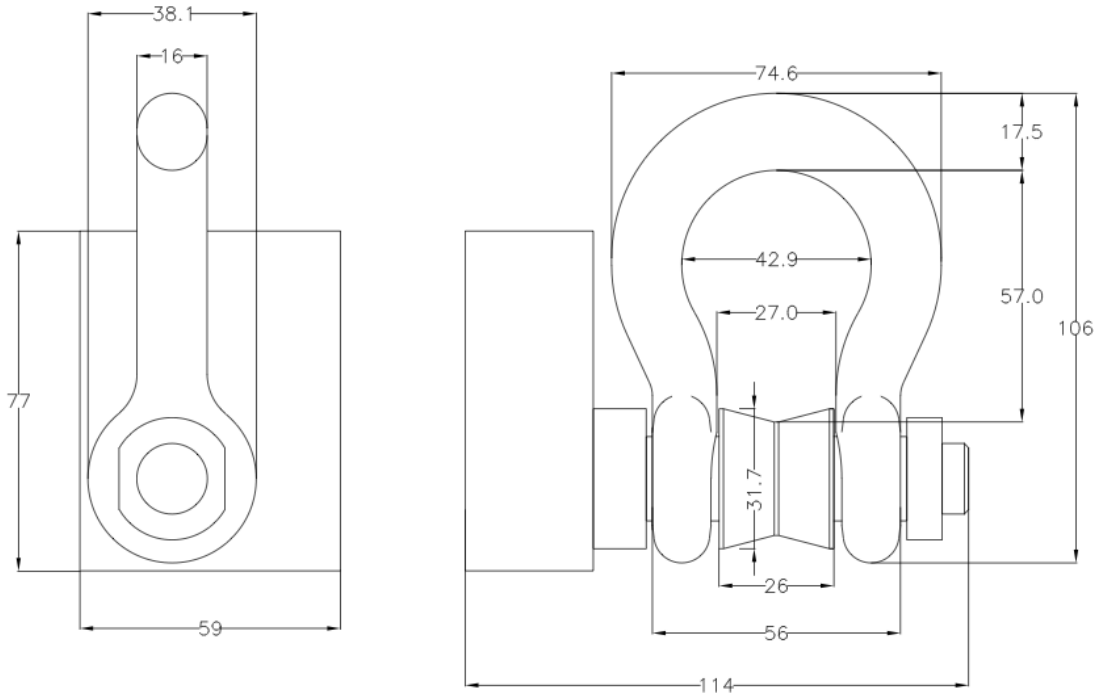
Very Noisy RF Environment Mode

For use in extreme radio environments where there is a lot of radio traffic and simply changing the radio channel does not allow you to avoid conflict with other radio systems.
Activating this feature makes the shackle more 'aggressive' in its radio transmissions and makes it easier to wake up.

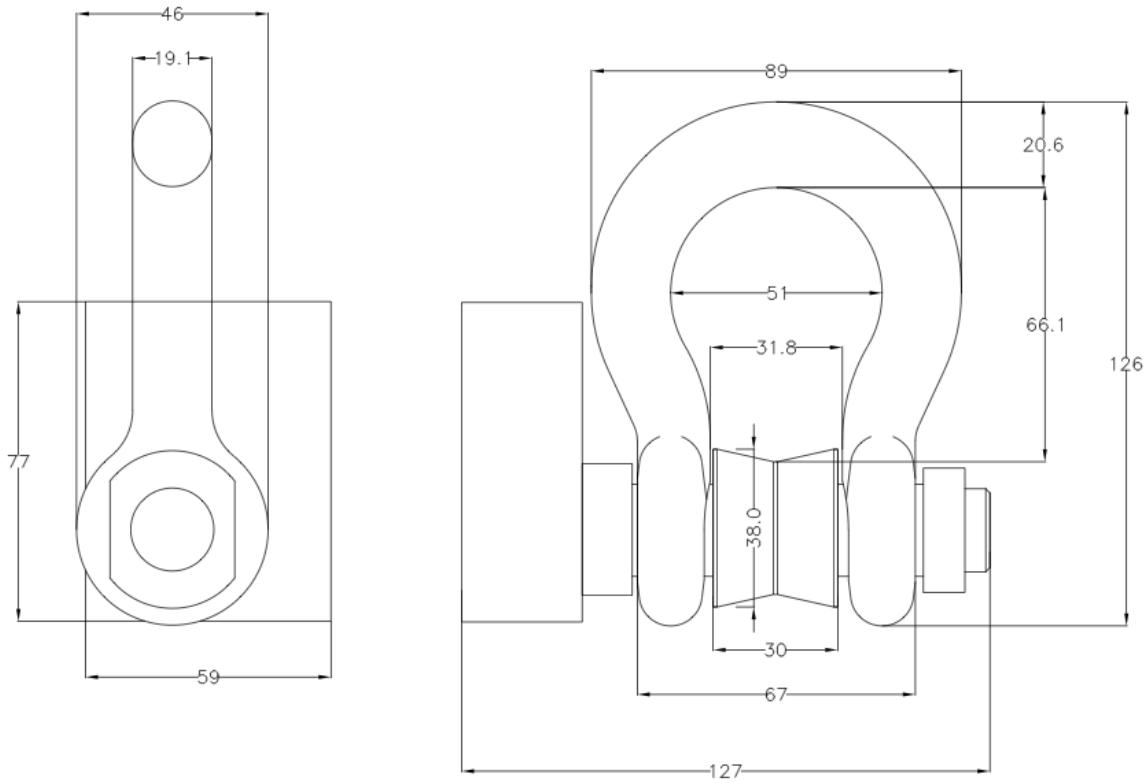
Enclosure & Mounting

Dimensions

BW-S325 BroadWeigh Shackle 3.25T dimensions



BW-S475 BroadWeigh Shackle 4.75T dimensions



Opening the Case

Remove the four screws, see Connecting Power

LED Indicator

The Broadway Shackle is fitted with an LED to provide a visual indication of data transmission from the acquisition module inside. The LED flashes whenever a data transmission occurs. Modules are pre-configured to provide readings once per second.

Flashing	data transmitting
Constant	paired to BroadWeigh Toolkit
Off	unit asleep

Specification

Measurement	Min	Typical	Max	Units
Weight Range (SWL)			3250 or 4750	kg
Accuracy		Typically ±1% of load or ±25 kg whichever is greater		

Power Supply	Min	Typical	Max	Units
Estimated Battery life 2 X AA Duracell batteries (1 update per second):				
Asleep		5+		Years
Continuous operation		3		Months
8 Hours Usage Per Day		8		Months
2 Hours Usage Per Day		2.5		Years

Environmental	Min	Typical	Max	Units
IP rating		IP67		
Operating temperature range	-20		+50	°C
Storage temperature*	-40		+85	°C
Humidity	0		95	%RH

* Excludes Batteries.

Radio Range

For details of radio range please refer to Appendix B – Radio Range

BW-WSS

Overview

The BW-WSS wireless anemometer is built on the same technology as other BroadWeigh wireless sensor interfaces offering the same sleep and wake functionality and operation with peripheral modules including handhelds and USB base stations.

The Anemometer features a high quality 3-cup rotor pressed on a stainless steel shaft with rugged Delrin body with bronze Rulon bushings

The output value of the anemometer can be configured to the user's requirements and measure over the range 5 to 125 mph.

Accuracy:

- 0.5 mph from 5 to 10 mph
- ± 4% from 10 to 125 mph

The BW-WSS is powered either from internal batteries or an external supply. For applications which require high sampling rates for long periods BroadWeigh's PowerPack and SolarPanel (PP1 & SP1) offers an ideal solution.

Order Codes

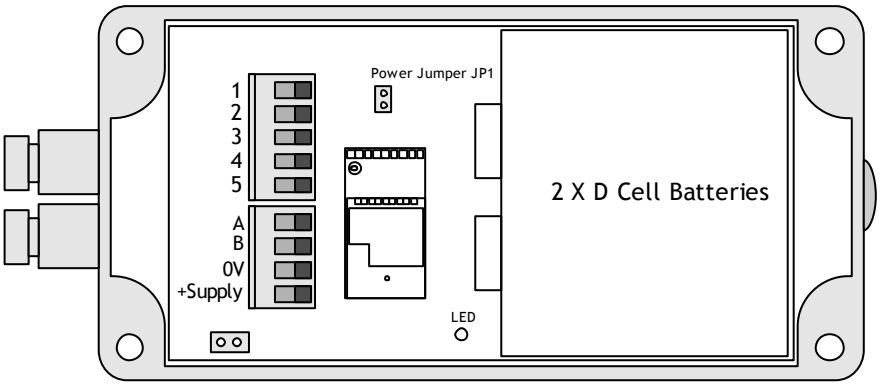
BW-WSS

Wireless wind speed transmitter module mounted in large weatherproof enclosure with battery holder for two D cell alkaline batteries. Also has ability to be powered from external supply voltage.

Connections

Power

Power can be supplied by fitting two D cell alkaline 1.5 V batteries or the module can be supplied from an external 5 Vdc to 18 Vdc source. The module will switch to the external supply in preference providing a battery backup.
In both cases the JP1 power jumper needs to be fitted to supply power to the transmitter module.
When powered from the external DC source the LED will illuminate.



Configuration

The BroadWeigh Toolkit provides a means of simple configuration and calibration of the transmitter module along with useful tools to aid integration.

Launch the BroadWeigh Toolkit software application and pair to this module to enable the connection to the Toolkit to allow configuration to take place. See Common Toolkit Pages - Home

Data Rates and Quality

BroadWeigh Toolkit
Data Rate
Transmit Interval (ms)
10000
Enter the interval between taking a measurement and transmitting the result. Default = 2000
Sample Time (ms)
1000
The longer the sample time the more accurate the readings but the less life will be achievable from the battery.Default = 1000
Low Power Mode
Yes
When Low Power mode is active the device semi-sleeps between transmissions so battery life is vastly increased. NOTE: After changing this mode you should power cycle the module after closing the Toolkit! Default = Yes
Help
Here you can adjust data rates and quality and see the effect your choices have on battery life.
The battery life guide is only an indication of battery life and there are many factors that can affect this which are not accounted for here.
The guide assumes ideal operating conditions at 20 degrees centigrade and that capacitor modules are fitted when using alkaline batteries.
Please refer to module manual for more information.
Battery Life Guide
Battery Type
Select a common battery type or enter a custom capacity.
2 X Alkaline D Cell 1.5V (Duracell LR20)
Usable Capacity (Ah)
10
Sensor mA from 5V excitation
2
Usage Per 24 Hour Period (Hours)
24
Noise Free Resolution:
Battery Life: 2 months and 23 days
Connected to BW-WSS of ID FFD09E on channel 14
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

This page allows you to select the rate at which data is transmitted from the transmitter module and the quality. By selecting low power mode and entering some other information the toolkit will also give guides on achievable battery life.
Note that the battery life calculator is assuming the best case scenario which is at 20 °C and that the battery has a suitable low internal resistance or that a suitable capacitor is fitted across the battery. See battery details in the Installation section.

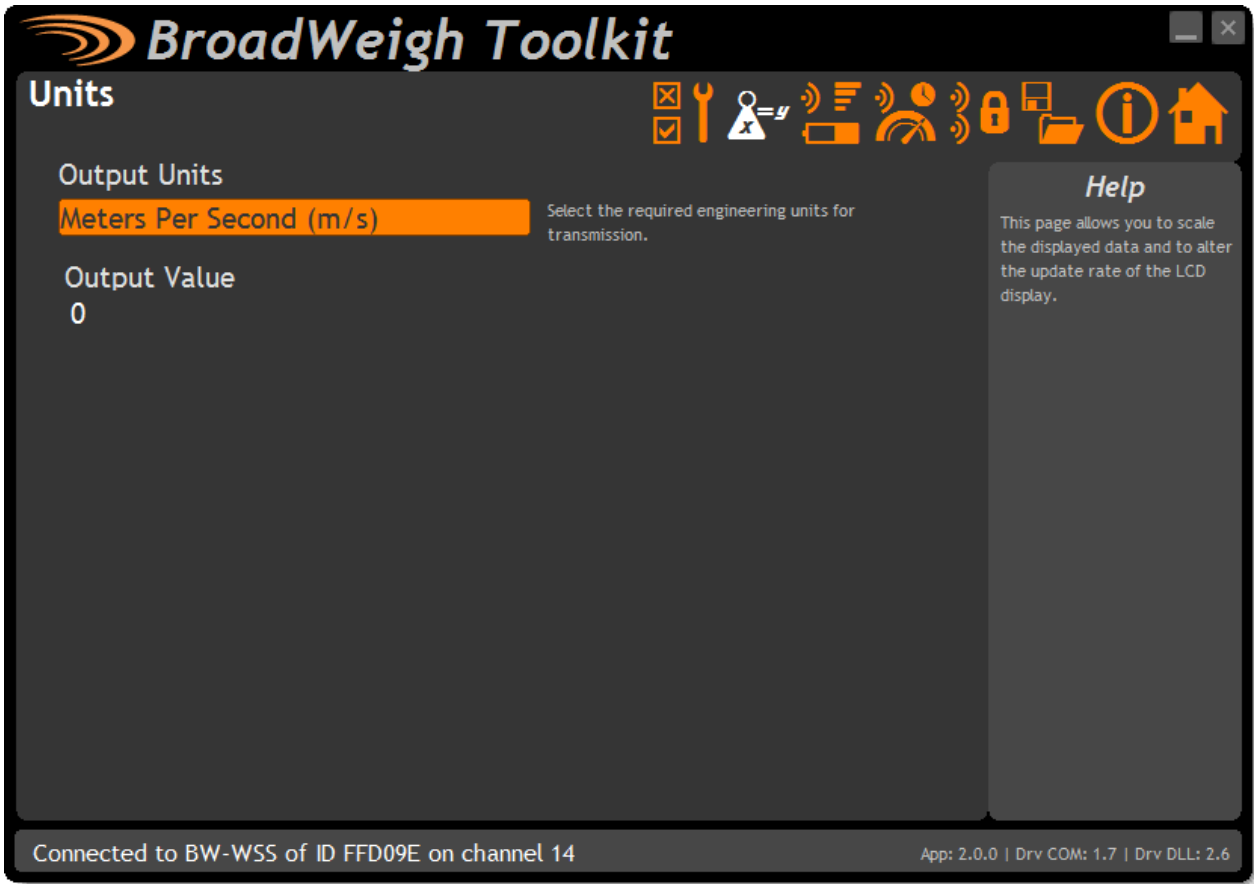
Items you can change:

Transmit Interval — Enter the transmission rate in milliseconds. The default is 2000 giving a reading every two seconds. You may want increase this value to slow transmissions down to achieve longer battery life.

> In order to capture wind speed of 3.5 mph the Sample time must be 1000 ms so the minimum TX interval is also 1000.

Sample Time	CHANGING THIS VALUE WILL EFFECT THE INPUT RANGE OF THE SENSOR This is the length of time in milliseconds that the input is sampled before the value is transmitted. The default value is 1000 ms allowing for wind speeds from 3.5 mph upward to be captured.
Low Power Mode	This module should be set to Low Power Mode.
Battery Type	This is not a parameter of the module but information used by the battery life guide. You can choose from some preset batteries or choose custom to allow you to select your own battery capacity. See below. This will also offer to change the Battery Low Level if the level suitable for the chosen battery is not the level currently set.
Usable Capacity	This is not a parameter of the module but information used by the battery life guide. This is the capacity of the battery in amp hours and has a profound effect on battery life calculations. This capacity needs to be calculated from battery manufacturer's data sheets to take into account that you can only use batteries down to 2.1 volts so in the case of twin AA cells this would be 1.05 volts. Generally the usable capacity will not be as high as that advertised by the battery manufacturer. Temperature and internal resistance of the battery are not taken into account in the guide.
Sensor mA from 5 V Excitation	This is the current drawn by the sensor; this should be set to 2mA for the BW-WSS to provide a conservative battery life guide.
Usage Per 24 Hour Period	Enter the number of hours per 24 hour period that the module will be turned on and transmitting.

Units


BroadWeigh Toolkit
Units
Output Units
Meters Per Second (m/s)
Select the required engineering units for transmission.
Output Value
0
Help
This page allows you to scale the displayed data and to alter the update rate of the LCD display.
Connected to BW-WSS of ID FFD09E on channel 14
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Output Value is the live value of the current wind speed in the units selected above.

Items you can change:

Output Units	Simply select the required output units from the drop down list. The BW-WSS can provide wind speed in m/s, mph, km/h and fps

BroadWeigh Toolkit
Advanced Settings
Sleep Delay (s)
0
Enter a time in seconds after which without receiving a 'Keep Awake' message the device will enter deep sleep where no transmissions will occur again until the device is woken.
Data Tag
C001
This identifies the data transmissions and should only be changed under instruction. If this is changed then you would need to pair the device again with any reliant modules such as handhelds.
Help
These are advanced settings and do not normally require changing.
Transmit Power (%)
100
Enter the transmission power level in percent. default is 100%
Connected to BW-WSS of ID F5EC5A on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

You should not normally need to change these settings.

Items you can change:

Sleep Delay	Here you can enter a delay in seconds after which the transmitter module will return to deep sleep if no Keep Awake message is heard from software, handheld or other receiving modules. The default is 60 seconds.
Data Tag	The data transmitted by the transmitter module is marked with a Data Tag which is a 2 byte hexadecimal code. By default this is set to the last 2 bytes of the module ID (or to put it another way, the last 4 characters of the module ID). If by some chance you had two transmitter module modules that would be working on the same channel and had the same last 4 characters in their ID (1 in 65535 chances) you may want to change the data Tag of one of the modules and perform pairing again with the handheld.
Transmit power	Set the transmit power level from 0–100%. Default is 100%

Enclosure & Mounting

The BW-WSS is designed to be attached to the top of a scaffold pole or equivalent using the fitted clamp.

Antennas

These modules have the antenna already fitted inside the enclosure so there are no specific mounting requirements.

Specification

Specification at 3V supply at 25°C

Parameter	Min	Typical	Max	Units
Battery Supply Voltage	2.1	3	3.6	Vdc
External DC Supply	5		18	Vdc
Operating Temperature Range	-20	-	55	°C
Storage Temperature Range	-40	-	85	°C
Humidity			95	%RH
Reverse Polarity Protection		-	-32	Vdc
Environmental protection with suitable cables exiting through cable glands.		IP67		
Measurement Range	5	-	125	mph
Accuracy 5 – 10 mph		0.5		mph
Accuracy 10 – 125 mph		±4%		mph

Environmental	Min	Typical	Max	Units
Operating temperature range	-40		+85	°C
Storage temperature	-40		+85	°C
Humidity	0		95	%RH

Power Supply	Min	Typical	Max	Units
Standby / Low power mode		5	20	µA
Normal Mode on constantly		55	60	mA
Power Supply voltage	5		18	Vdc
Power Supply ripple			50	mV ac pk-pk

Battery Life in Low Power Mode Generating Results every 2 seconds With sample time of 1 second	Usage	Battery Life
Pair D cells	Constantly on	14 days
Pair D cells	12 sessions per day of 5 minutes	1 year

Radio Range

For details of radio range please refer to Appendix B – Radio Range

Receiver Modules

Receiver modules use the messages sent by the transmitter modules. These modules may process or display this information or convert the data into a different physical format.

BW-HR

Overview

The BW-HR is a roaming handheld that can be used to view the reading supplied by an unlimited number of BroadWeigh shackles. The shackle module Data Tags or IDs do not need to be known beforehand.

The handheld will automatically wake any shackle on the same channel and group key.
An internal list is maintained of the top ***n*** number of transmitter modules ordered by signal level and a **Next** key on the handheld allows cycling through this list.
The list size (***n***) is variable between 2 and 20 and this enables the viewing experience to be tailored to particular applications.

The transmitter modules are identified by their 4 character hexadecimal Data Tags and these may be set using the BroadWeigh Toolkit.

When in communication with a particular shackle the LED on that shackle is activated. This provides visual feedback of the selected and currently viewed shackle.

Order Codes

BW-HR

Handheld display for unlimited number of shackles in a robust weatherproof enclosure.

Connections

Power

The handheld module is powered by two alkaline AA batteries.

> Due to the higher voltage requirements of this module NiMh and NiCad batteries are not recommended.

Operation

View readings

Turn the handheld on by pressing and holding the ⏻ symbol (on the right) until the display is active. This will wake the radio and measurement system in the BroadWeigh shackle(s). The factory default displayed value is in kg.

The handheld display automatically switches 'on' the shackles as soon as they are in range. The handheld will then display the shackle with the strongest signal – in most cases the nearest shackle.

Select a new shackle to display by pressing the ▶ key and the shackle data tag will be shown briefly before the reading is displayed. The data tag is (by default) the last 4 characters of the ID which can be found on the shackle label.

By pressing and holding the ▶ key, the shackle Data Tag currently being measured will be shown.
The currently selected shackle LED will also change from flashing to permanently on.
The handheld can read from an unlimited number of shackles.
The BroadWeigh shackles is pre-set to return to sleep 60 seconds after the handheld is turned off or is taken out of range.

> ℹ TIP! – The BroadWeigh Shackle Data Tag can be changed to an easily remembered 4 digit hexadecimal code to reflect its position within your system. For example 'A001'. See BroadWeigh Shackle – Advanced settings.

Keys

⏻ **Power Key** - Press and hold the power key for approximately 2 seconds then release the key.
This will toggle between turning the handheld on and off.
Can also be used, by giving a quick press, to reset the Auto-Sleep delay.

▶ **Next Key** - Selects the next shackle to view.
Pressing and holding will display the currently viewed module Data Tag without moving to the next module.

Indicators

SIG LOW The radio signal from the shackle is low. The shackle is still functioning but the limit of the range may be near. Communications may start to deteriorate when this indicator is visible. Until ------ is displayed the communications is still OK and the display can be relied on for accuracy.

> ℹ Even with a degraded signal the display value will always be correct.

BATT LOW The batteries in the handheld are low and need to be replaced.

REMOTE ERROR	The shackle has an error that the handheld does not recognise.
REMOTE BATT LOW	The battery in the shackle is low.

Errors

Displayed on handheld LCD.

Error 1	The shackle is in shunt calibration mode. An external module or software may have placed the shackle in Shunt Calibration mode so rather than display a misleading reading this error is displayed instead.
Error 2	Input integrity error. The shackle module has found a problem with the input. There may be open or short circuits. Rather than display a misleading reading this error is displayed instead.
Overload	The overload limit set by the user has been exceeded.

Special Modes

Pair

The handheld has the ability to configure a shackle to match the handheld's own radio channel and group key settings.
Ensure that the transmitter module is unpowered for at least 10 seconds.
Locate the upper left key by feeling for a slight bump on the label.

Press and hold this key for 5 seconds until PAIRING appears on the LCD.
Release the key and apply power to the shackle.

The amount of time you have to reapply power to the transmitter module can be set by **PairDuration** in the BroadWeigh Toolkit when connected to the BW-HR. This defaults to 5 seconds.

System Zero

The handheld has the ability to perform a system zero on a shackle. This may be useful after installing new shackles and enables system zero to be set without the need for a PC/laptop and BroadWeigh Toolkit.

Set the handheld to view the desired shackle by using the Next key.

Locate the upper right key and lower right key by feeling for slight bumps on the label.

Press and hold these keys for around 8 seconds until ZERO appears on the LCD. Release the keys and the display should then show the zeroed reading.

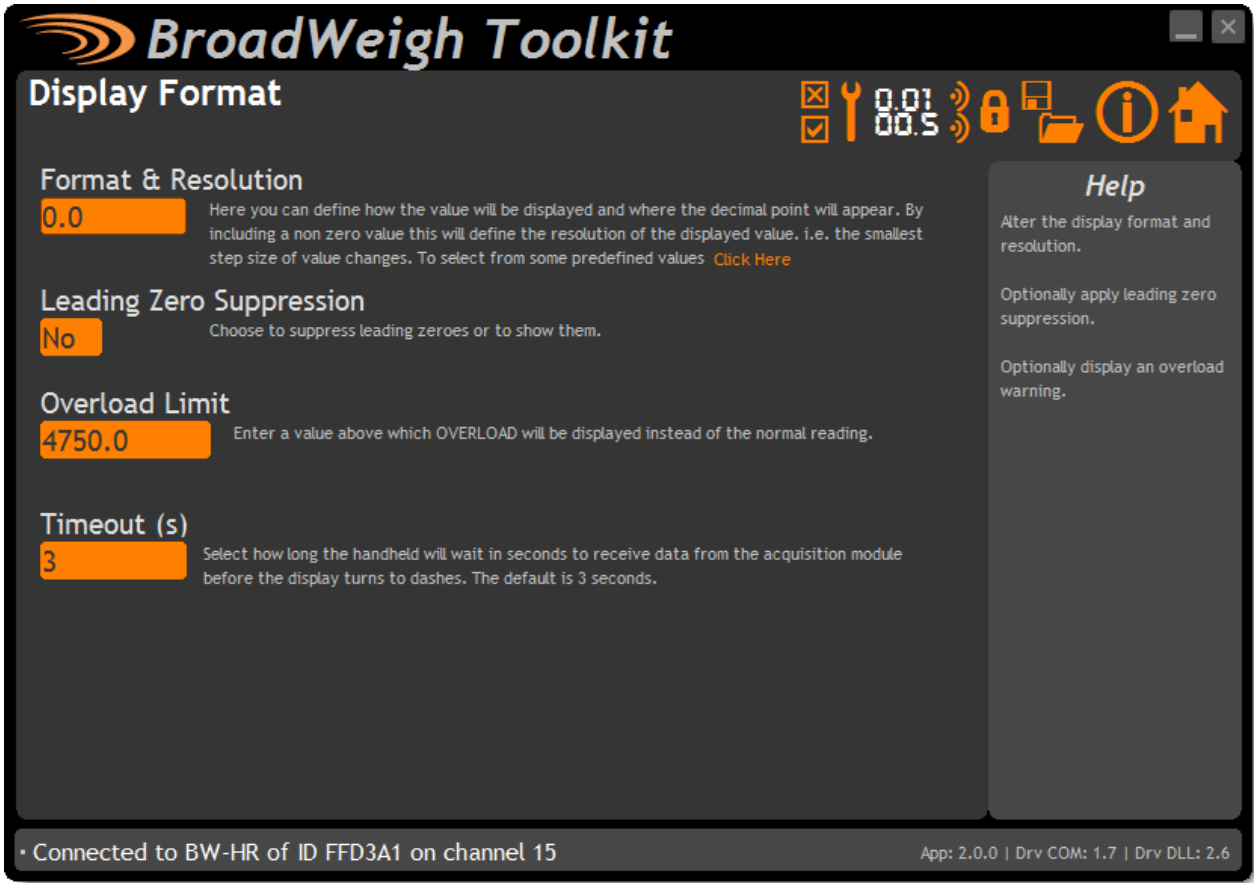
This system zero is performed at the shackle and is stored through power cycling.

> You cannot remove a system zero using this function. You can only re-zero.
> To remove a system zero you must pair to the shackle using the Toolkit and remove it from there.

Configuration

Launch the BroadWeigh Toolkit software application and pair to this module to enable the connection to the Toolkit to allow configuration to take place. See Common Toolkit Pages - Home

Display Format

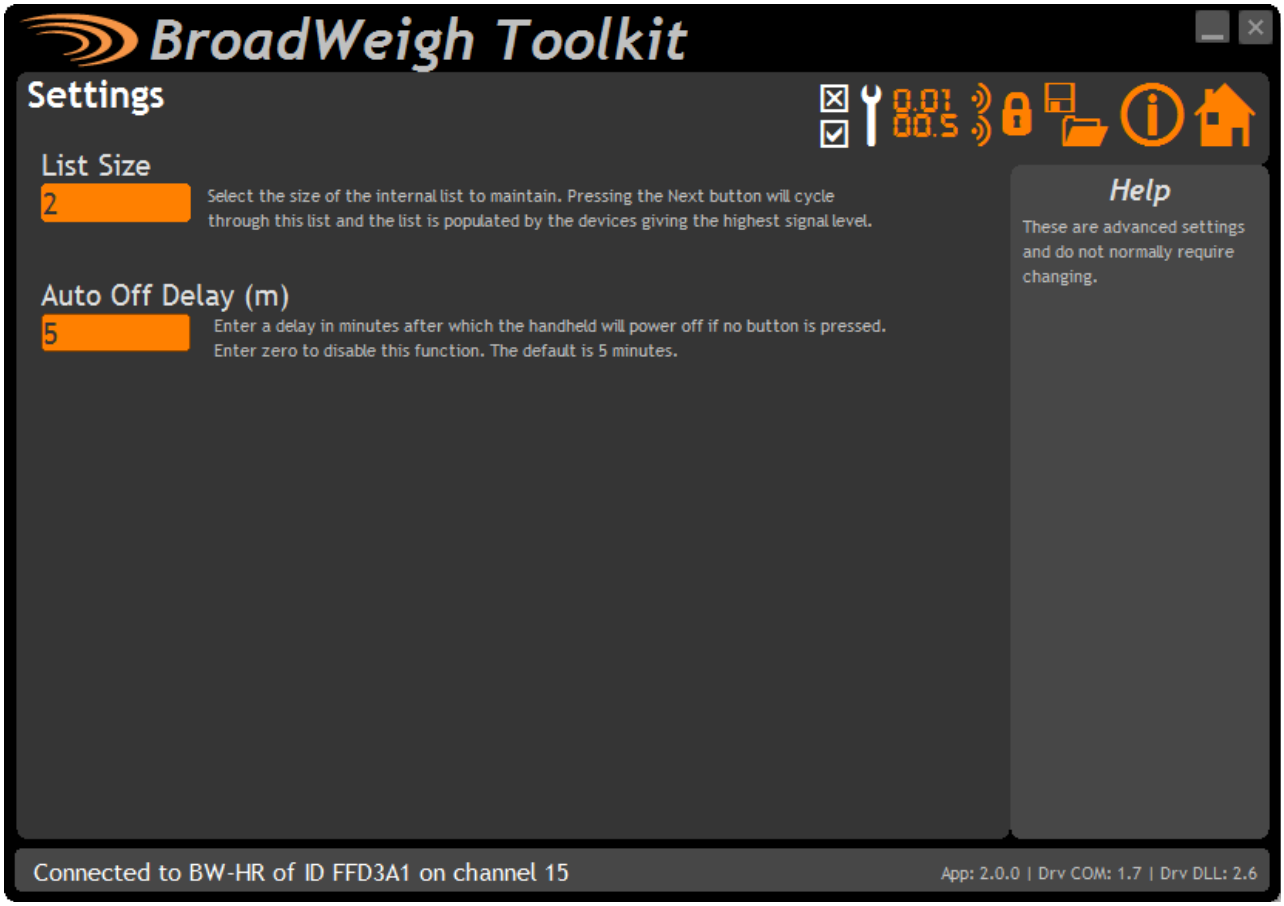

BroadWeigh Toolkit
Display Format
Format & Resolution
0.0
Here you can define how the value will be displayed and where the decimal point will appear. By including a non zero value this will define the resolution of the displayed value. i.e. the smallest step size of value changes. To select from some predefined values Click Here
Leading Zero Suppression
No
Choose to suppress leading zeroes or to show them.
Overload Limit
4750.0
Enter a value above which OVERLOAD will be displayed instead of the normal reading.
Timeout (s)
3
Select how long the handheld will wait in seconds to receive data from the acquisition module before the display turns to dashes. The default is 3 seconds.
Help
Alter the display format and resolution.
Optionally apply leading zero suppression.
Optionally display an overload warning.
Connected to BW-HR of ID FFD3A1 on channel 15
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can adjust the display.

Items you can change:

Format & Resolution	Here you can define how the values are displayed on the LCD. There are 7 digits available and you can define where the decimal point is shown by entering text where a zero indicates a numeric digit position. When the data is being displayed the number of decimal places you define may be overridden as the display will always show the correct number of integer digits. Example: If you set the format to 000.0000 and the value to display is 1000.1234 the display will show 1000.123 You can also define the resolution, which is the block size of changes to the display. Example: If you enter the format as 000.0005 the display will only change in steps of 0.0005 which can be used to mask noisy digits at high resolutions.
Leading Zero Suppression	This can be turned on or off and will suppress leading zeroes when on. Example: If the display reads 000.123 with leading zero suppression turned off it will display 0.123 when turned on.

Overload Limit	You can enter a limit here above which **Overload** will be shown on the display instead of the actual value. Enter zero to disable this feature.
Timeout	Enter the timeout in seconds. This sets the time allowed without any data arriving from the viewed module before all dashes are displayed on the LCD. Should be at least 3 times the interval between the messages being sent by the transmitter module.


BroadWeigh Toolkit
Settings
List Size
2
Select the size of the internal list to maintain. Pressing the Next button will cycle through this list and the list is populated by the devices giving the highest signal level.
Auto Off Delay (m)
5
Enter a delay in minutes after which the handheld will power off if no button is pressed. Enter zero to disable this function. The default is 5 minutes.
Help
These are advanced settings and do not normally require changing.
Connected to BW-HR of ID FFD3A1 on channel 15
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

You should not normally need to change these settings.

Items you can change:

List Size

This setting determines how many of the transmitter modules with the highest signal level make up the list which the next key cycles around.

Based on the application and how many transmitter modules are in the vicinity of the handheld this list size can affect how the operator uses the handheld.

Range is between 2 and 20.

Auto Off Delay

Here you can specify the delay in minutes after which the handheld will automatically turn off after no button is pressed.
Enter zero to disable this function. The default is 5 minutes.

Enclosure & Mounting

See Appendix A – Handheld Style section for more information.

Antennas

These modules have the antenna already fitted inside the enclosure so there are no specific mounting requirements.

Specification

Electrical	Min	Typical	Max	Units
Power Supply voltage	2.5	3.0	3.6	Vdc

Power Supply	Min	Typical	Max	Units
Active		35	40	mA
Low power mode		120	160	µA
Estimated Battery life using 2Ahr batteries:				
Standby mode (Powered off)		1.5		Years
Continuous operation		40		Hours

Environmental	Min	Typical	Max	Units
IP rating		IP67		
Operating temperature range	-10		+50	°C
Storage temperature	-40		+85	°C
Humidity	0		95	%RH

Physical	
Hand Held Dimensions	90 x 152 x 34 mm

Radio Range

For details of radio range please refer to Appendix B – Radio Range

BW-RM1

Overview

The BW-RM1 offers dual power relays capable of mains power switching. These relays can be configured as high, low or window alarms and can be associated with a group of up to 8 BroadWeigh transmitter modules per relay. Relays can operate when the sum of the assigned transmitter modules reach a set point or when any of the modules reach the set point. There is also a mode where the difference between the lowest and highest value is compared to the set point. This is useful for applications where you are looking for a group of weights to be within a certain band. i.e. hanging truss.
Relays can be latched and a digital input or external command can be used to reset them.
An alarm/error signal relay is operated if communication is lost or other selectable errors occur and this alarm resets once the source of the alarm or error is removed.
This module is supplied in an IP67 sealed ABS case.
The state of the power relays during an error can be selected.

Order Codes

BW-RM1

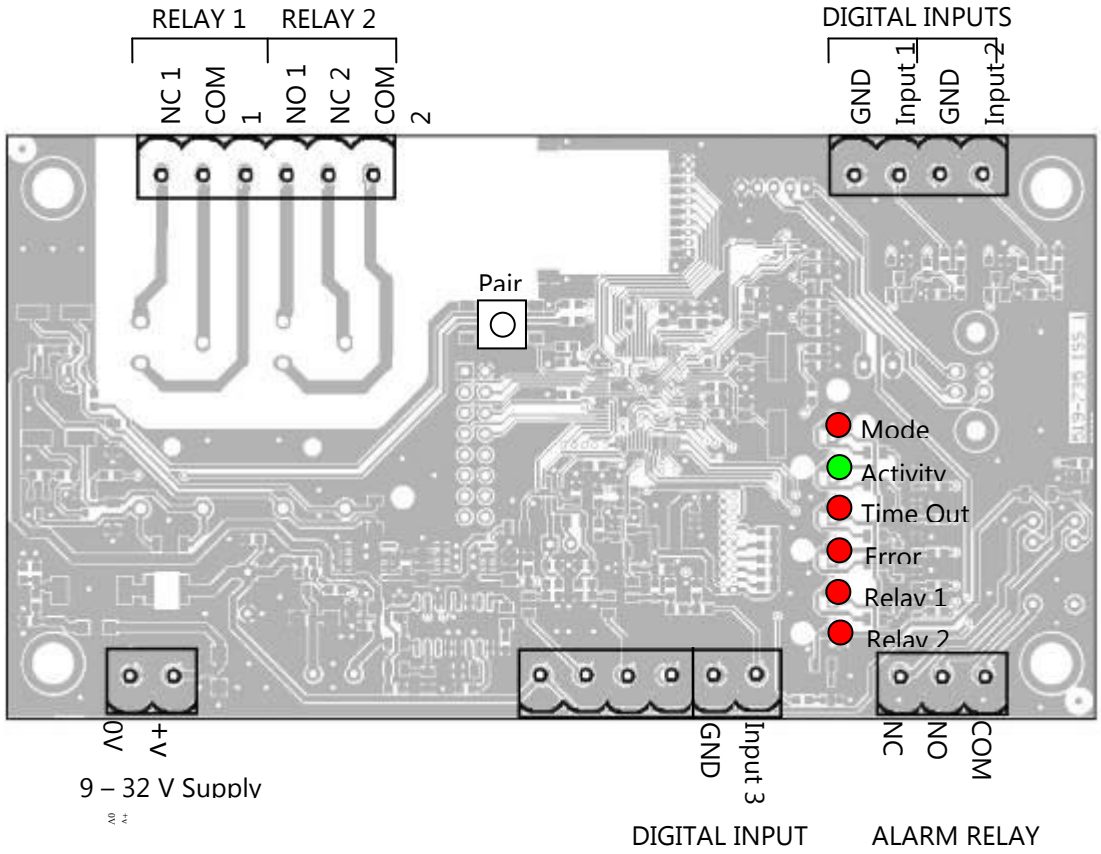
Relay module housed in weatherproof enclosure.

Connections

Power

You will need to connect power to the BW-RM1 for it to operate. Only power is required to enable configuration using a base station and the appropriate toolkit software.
Power is connected to the two part two way screw terminal connector as shown in the diagram below.

Connections & Indicators



LEDs

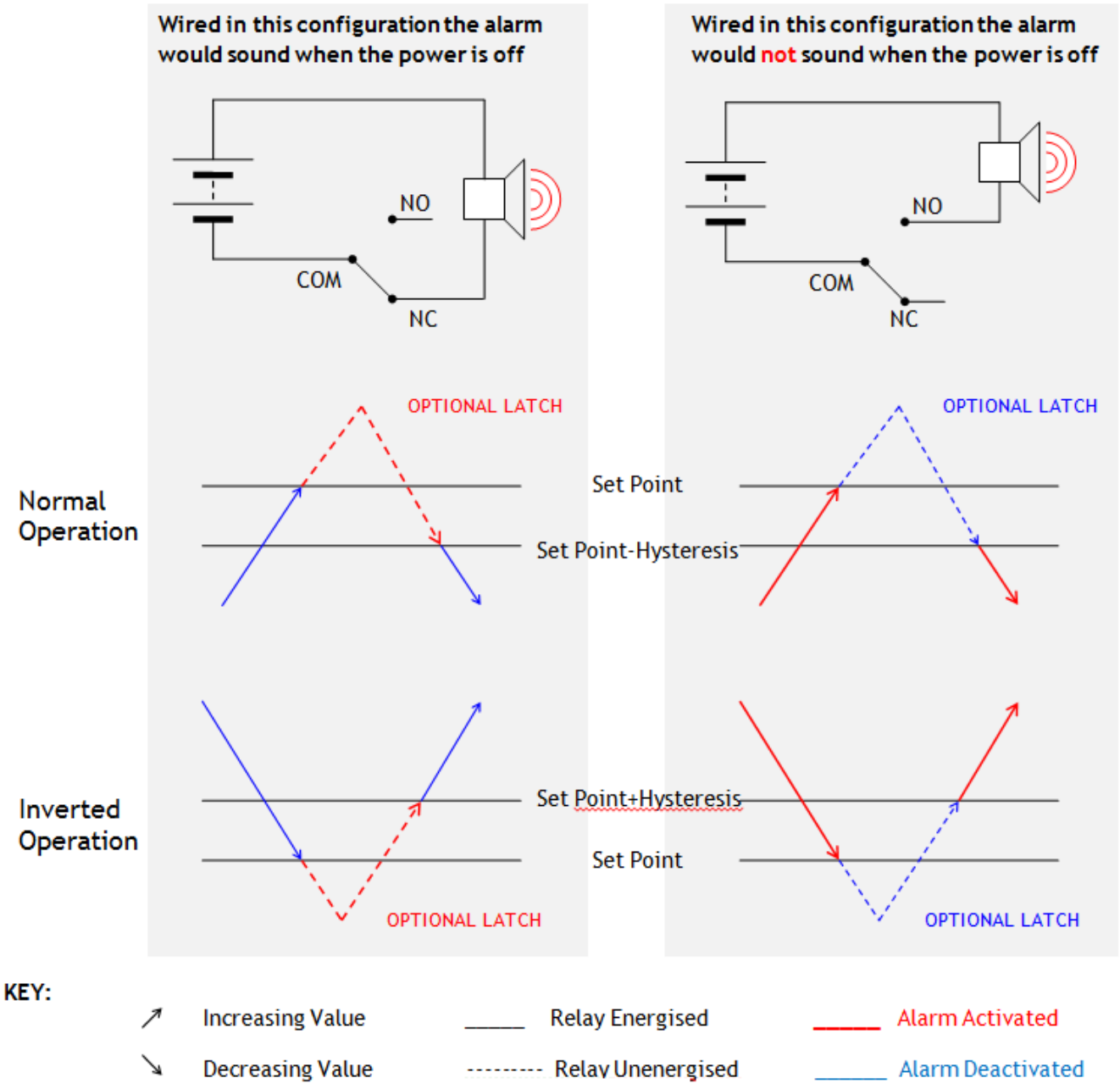
Mode	Flashes 2 x per second when operational
Activity	Flashes when BroadWeigh data packets are received
Time Out	No BroadWeigh data present for longer than user defined period
Error	One or more contributing modules are reporting an error
Relay 1	Relay 1 Energised (Connection between COM and NO)
Relay 2	Relay 2 Energised (Connection between COM and NO)

Inputs

Digital Input 1	Can either reset a latched relay 1 or transmit a Data Provider Packet of a specified Data Tag
Digital Input 2	Can either reset a latched relay 2 or transmit a Data Provider Packet of a specified Data Tag
Digital Input 3	Resets both latched relays

Operation

The BroadWeigh RM1 can accept 8 BroadWeigh data inputs for each of the two relays, the total of the inputs compared to the set point and mode of the relay channel affects whether the relay is energised or not. In addition when considering the use of relays attention should be paid as to what state the system will be in when the power is off and the relays are de-energised. The diagram below outlines how wiring and normal and inverse modes influence the state of relays.
(COM = Common, NO = Normally Open, NC = Normally Closed)



Relays can change state due to the following events:

- Arrival of BroadWeigh data from user defined BroadWeigh module that causes the relay output to trigger.
- Triggering of digital input 1 or 2 (switch input) which if configured reset latched relays
- Arrival of data from a specified data tag can reset latched relays.
- A change in error state of a module specified in a relays list of inputs

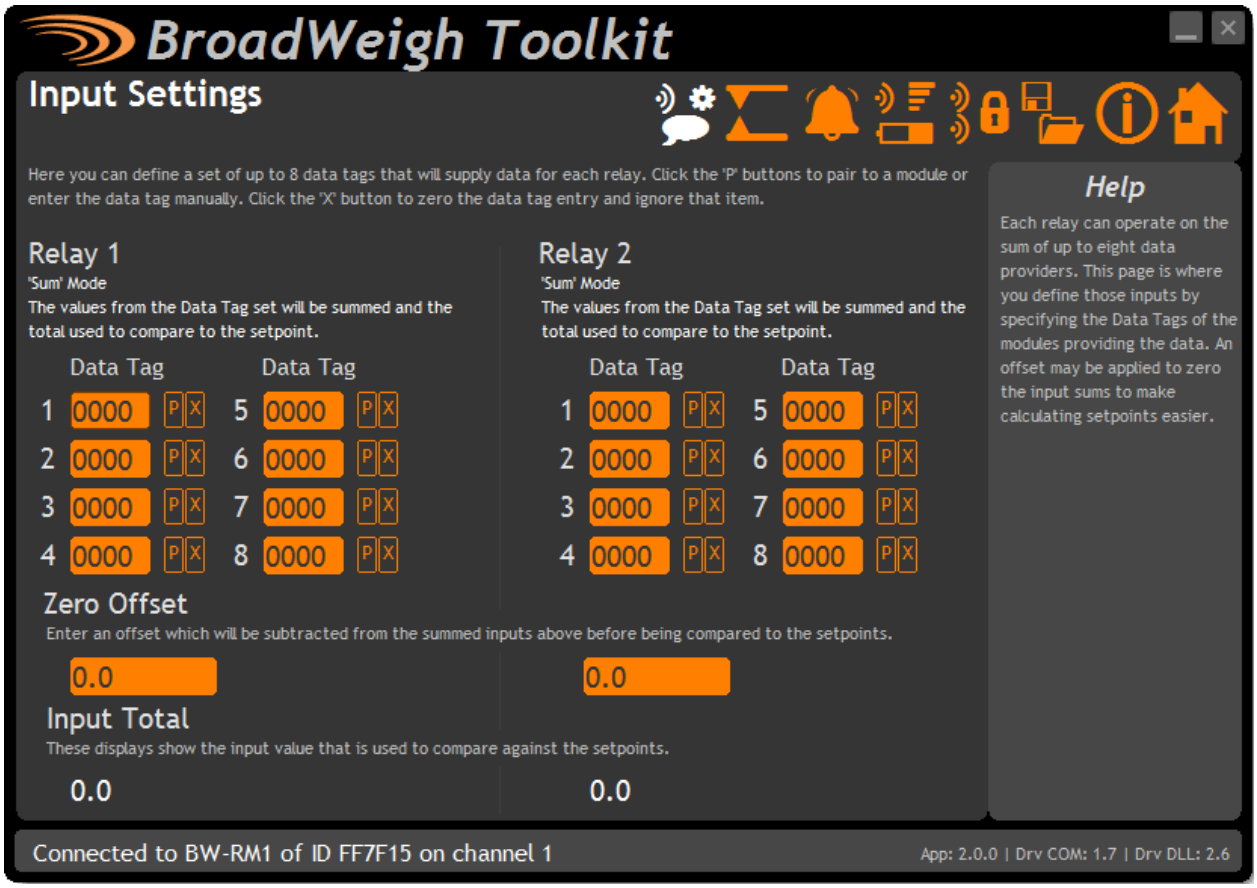
The BW-RM1 also features a third Alarm relay. The Alarm relay is energised from start up, (alarm connection made between COM and NC). The relay de-energises if an error is detected. An error is classed as a timeout and optionally can include Integrity error or low Battery. The Alarm Relay will return to normal (energised) once the source of the error is removed.

Configuration

The BroadWeigh Toolkit provides a means of simple configuration of the module along with useful tools to aid integration.

Launch the BroadWeigh Toolkit software application and pair to this module to enable the connection to the Toolkit to allow configuration to take place. See Common Toolkit Pages - Home

Input Settings

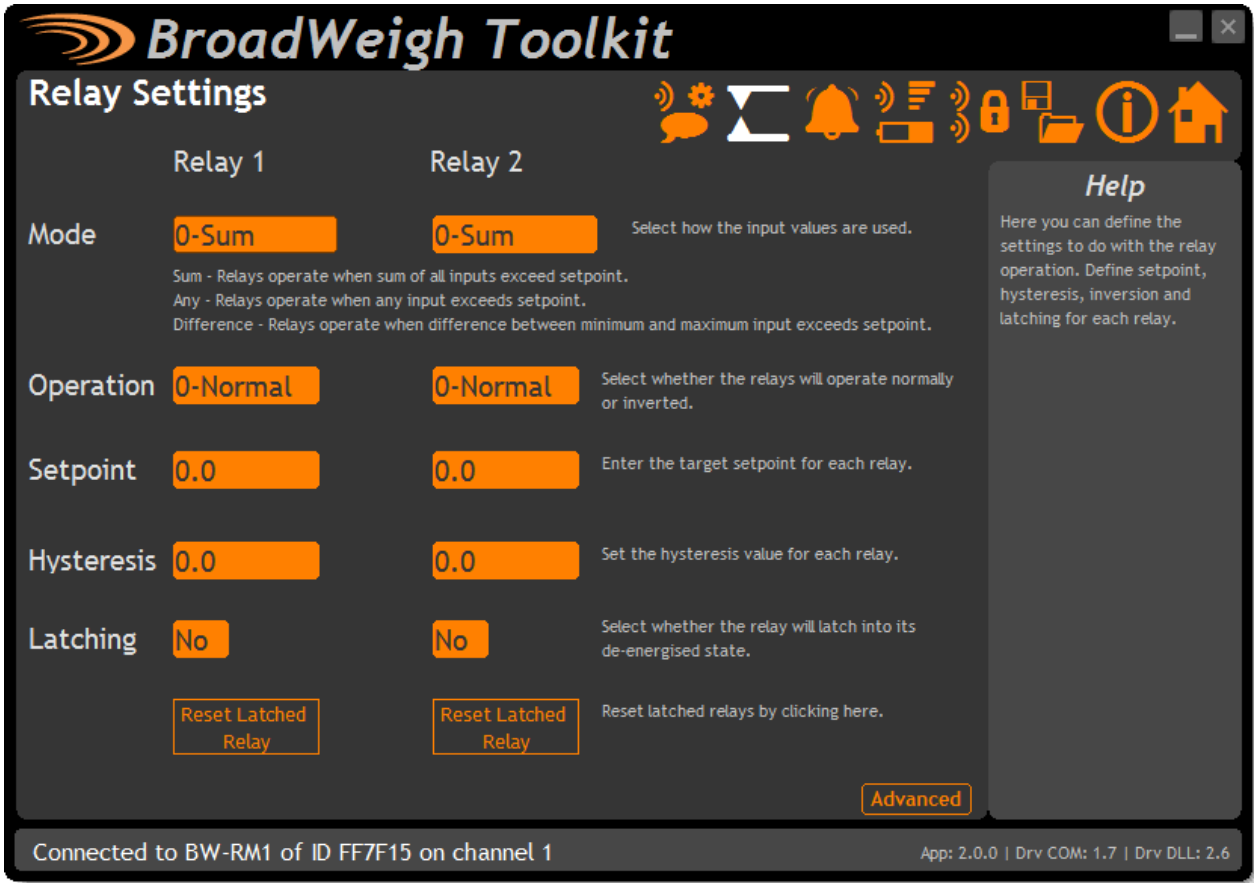

BroadWeigh Toolkit
Input Settings
Here you can define a set of up to 8 data tags that will supply data for each relay. Click the 'P' buttons to pair to a module or enter the data tag manually. Click the 'X' button to zero the data tag entry and ignore that item.
Help
Each relay can operate on the sum of up to eight data providers. This page is where you define those inputs by specifying the Data Tags of the modules providing the data. An offset may be applied to zero the input sums to make calculating setpoints easier.
Relay 1
'Sum' Mode
The values from the Data Tag set will be summed and the total used to compare to the setpoint.
Relay 2
'Sum' Mode
The values from the Data Tag set will be summed and the total used to compare to the setpoint.
Data Tag
Data Tag
Zero Offset
Enter an offset which will be subtracted from the summed inputs above before being compared to the setpoints.
0.0
0.0
Input Total
These displays show the input value that is used to compare against the setpoints.
0.0
0.0
Connected to BW-RM1 of ID FF7F15 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can set the Data Tags of the data used as the inputs.
The description below the 'Relay1' and 'Relay2' captions indicate the way in which the values from the Data Tags will be used to compare against the setpoint to determine whether the relay will activate.
See the **Relay Operation Settings** section for details.

Items you can change:

Relay 1 Data Tag [1-8]	Enter up to eight Data Tags the data from which will be used to determine the value compared to the set point to control relay 1.
Relay 2 Data Tag [1-8]	Enter up to eight Data Tags the data from which will be used to determine the value compared to the set point to control relay 2.
Zero Offset [1-2]	This value will be subtracted from the total of the summed data from the data tags for Relay 1 and Relay 2. Only used in Sum mode.

Relay Settings

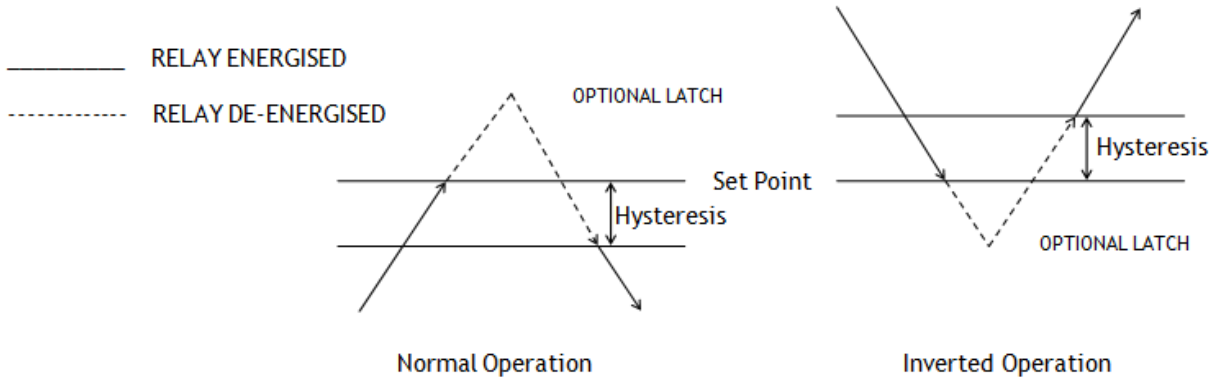

BroadWeigh Toolkit
Relay Settings
Relay 1
Relay 2
Mode
0-Sum
0-Sum
Select how the input values are used.
Sum - Relays operate when sum of all inputs exceed setpoint.
Any - Relays operate when any input exceeds setpoint.
Difference - Relays operate when difference between minimum and maximum input exceeds setpoint.
Operation
0-Normal
0-Normal
Select whether the relays will operate normally or inverted.
Setpoint
0.0
0.0
Enter the target setpoint for each relay.
Hysteresis
0.0
0.0
Set the hysteresis value for each relay.
Latching
No
No
Select whether the relay will latch into its de-energised state.
Reset Latched Relay
Reset Latched Relay
Reset latched relays by clicking here.
Advanced
Help
Here you can define the settings to do with the relay operation. Define setpoint, hysteresis, inversion and latching for each relay.
Connected to BW-RM1 of ID FF7F15 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change various settings that influence the operation of the individual relays.

Items you can change:

Mode [1-2]	This setting determines how the Data Tag values are used to compare against the setpoint. This is only available in firmware versions 2.0 and above. Previous versions will operate only in 'Sum' mode. • **Sum** – The values of the defined Data Tags are summed and this summed total is compared to the setpoint. • **Any** – The Data Tag with the highest value is compared to the setpoint. i.e. If any of the individual transmitter modules exceed the setpoint. • **Difference** - The difference between the lowest and highest values of all the Data Tags is calculated and this difference (Which is absolute i.e. always positive) compared to the setpoint.
Operation [1-2]	Whether set to normal or inverse decides how the relay state corresponds to the set point and hysteresis. (See diagram on next page)
Setpoint [1-2]	The Set Point is the level at which the relay state will change, see below.
Hysteresis [1-2]	This value sets an offset between when the relay is energised and de-energised creating a de-bounce for the relay. (See diagram on next page)
Latching [1-2]	Latching locks the state of the relay when it passes the set point.
Advanced Button	Displays the Relay Settings Advanced page.

Operation and Hysteresis Settings



Relay de-energises when reaching the set point.

Relay Settings Advanced

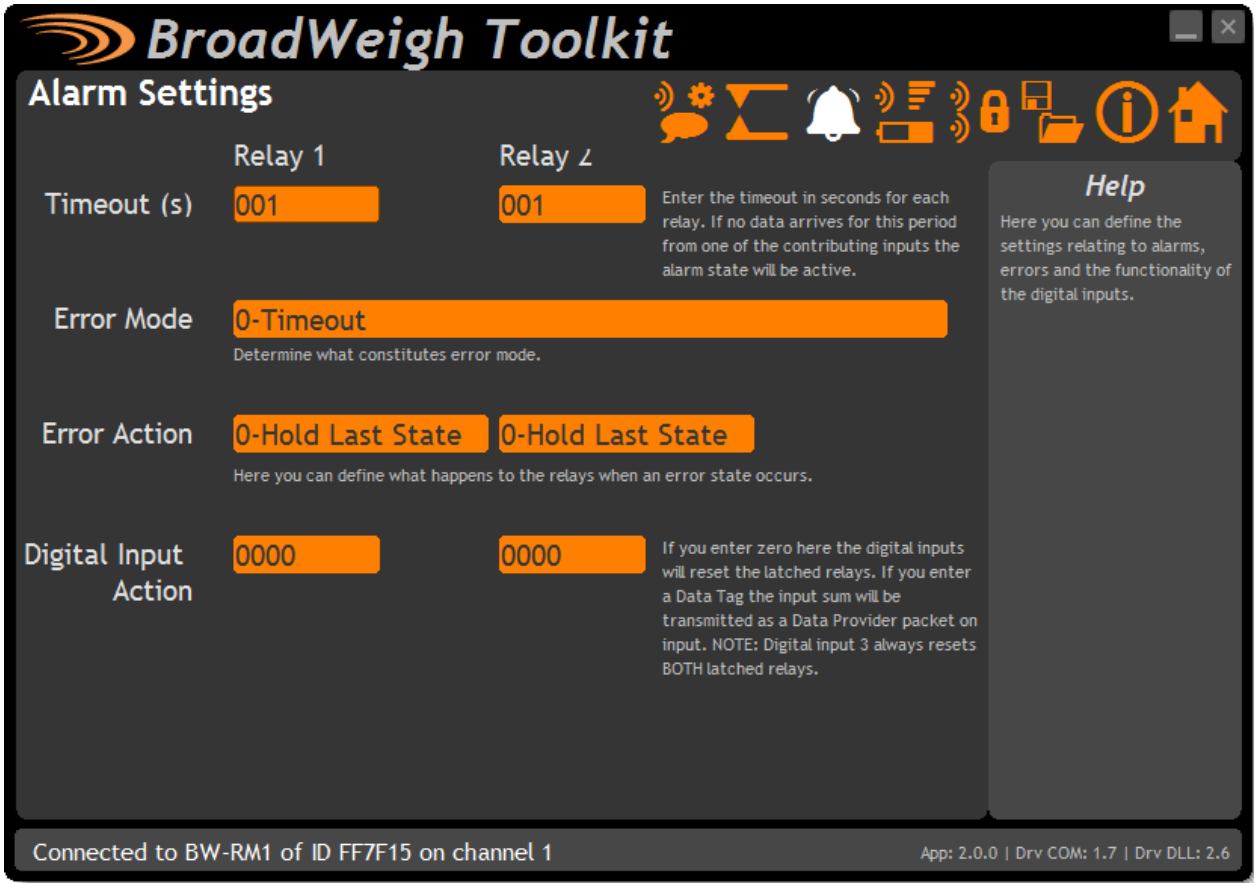
BroadWeigh Toolkit
Relay Settings Advanced
Relay 1
Relay 2
Relay Reset Data Tag
0000
0000
Here you can define a Data Tag which, on receipt by the T24-RM1 module, will reset a latched relay.
Help
This advanced page allows you to define the Data Tags which will reset latched relays.
Waker Duration (ms)
12000
If you want this module to wake up acquisition modules when it is powered up enter a Waker Duration time here in milliseconds. This will set how long the module attempts to wake acquisition modules. The default is 12 seconds (12000 mS). See manual for operational notes.
Back
Connected to BW-RM1 of ID FF7F15 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change various settings that influence the operation of the individual relays.

Items you can change:

Relay Reset Data Tag [1-2]	Enter a Data Tag that on receipt will reset the latched relay. Enter zero to disable this feature. Only useful if custom software or modules are utilised.
Waker Duration	Enter zero to disable this feature. Enter a time in milliseconds for this module to attempt to wake transmitter modules when first powered up. The default is 12000 milliseconds (12 seconds). All modules on the same radio channel and sharing the same Group key will be woken when the relay module powers up when this function is enabled. Transmitter modules will be kept awake while this module has power applied. The transmitter modules should have a Sleep Delay set so that after the relay module has been powered down the transmitter modules then return to sleep.

Alarm Settings


BroadWeigh Toolkit
Alarm Settings
Relay 1
Relay 2
Timeout (s)
001
001
Enter the timeout in seconds for each relay. If no data arrives for this period from one of the contributing inputs the alarm state will be active.
Help
Here you can define the settings relating to alarms, errors and the functionality of the digital inputs.
Error Mode
0-Timeout
Determine what constitutes error mode.
Error Action
0-Hold Last State
0-Hold Last State
Here you can define what happens to the relays when an error state occurs.
Digital Input Action
0000
0000
If you enter zero here the digital inputs will reset the latched relays. If you enter a Data Tag the input sum will be transmitted as a Data Provider packet on input. NOTE: Digital input 3 always resets BOTH latched relays.
Connected to BW-RM1 of ID FF7F15 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

This page defines how the individual relays will react to time outs and errors present from any defined BroadWeigh module, as well as how Digital inputs 1 and 2 are used.

Items you can change:

Timeout	Enter a time in seconds that if exceeded the BW-RM1 will affect the relay state according to the error action, as well as set the alarm relay and light the time out LED
Error Mode	The error mode defines what causes the alarm relay and individual error action to be triggered. Errors can be defined as • Time out • Time out or Low Battery • Time out or Low Battery or Integrity Error
Error Action	For each relay the action upon error detection can be defined as ; • Hold Last State • De-Energise Relay • Energise Relay
Digital Input 1	Digital input 1 can be used to either • Reset Relay 1 from its latched state • Transmit a data provider with user defined data tag containing the total of the inputs of Relay 1
Digital Input 2	Digital input 2 can be used to either • Reset Relay 2 from its latched state • Transmit a data provider with user defined data tag containing the total of the inputs of Relay 2

Enclosure & Mounting

This module is fitted inside our large, ACM ABS enclosure. Please see Appendix A – Enclosures & Mounting – ACM for more information.

Antennas

These modules have the antenna already fitted inside the enclosure so there are no specific mounting requirements.

Specification

	Min	Typical	Max	Units
PSU	9	-	32	Vdc
Operational Current All Relays Active		155*		mA
Operational Temperature Range	-10		60	°C
Storage Temperature Range	-40		70	°C
Power Relays		240 V 5 A		
Alarm Relay		1 A 24 Vdc	1 A 120 Vac	

* At 12 V nominal Supply

Radio Range

For details of radio range please refer to Appendix B – Radio Range

Base Stations & Repeater Modules

Base stations are required for configuration of the BroadWeigh modules using the BroadWeigh Toolkit software. They are also used to supply data to PCs and PLCs.
Repeaters allow the effective radio range to be increased, allow better coverage and to divert around obstacles.

BW-BSue

Overview

Base stations are the interface between the BroadWeigh radio system and a PC, PLC or other controller.
A base station would be required to configure BroadWeigh modules from a PC using the BroadWeigh Toolkit software and also required if you are to capture data from BroadWeigh modules to a PC or PLC.

Order Codes

Base station in weatherproof enclosure with USB connection.

Connections

This base station simply connects to the USB port of a PC and is powered from the USB bus.

Configuration

The BroadWeigh Toolkit provides a means of simple configuration and calibration of the transmitter module along with useful tools to aid integration.

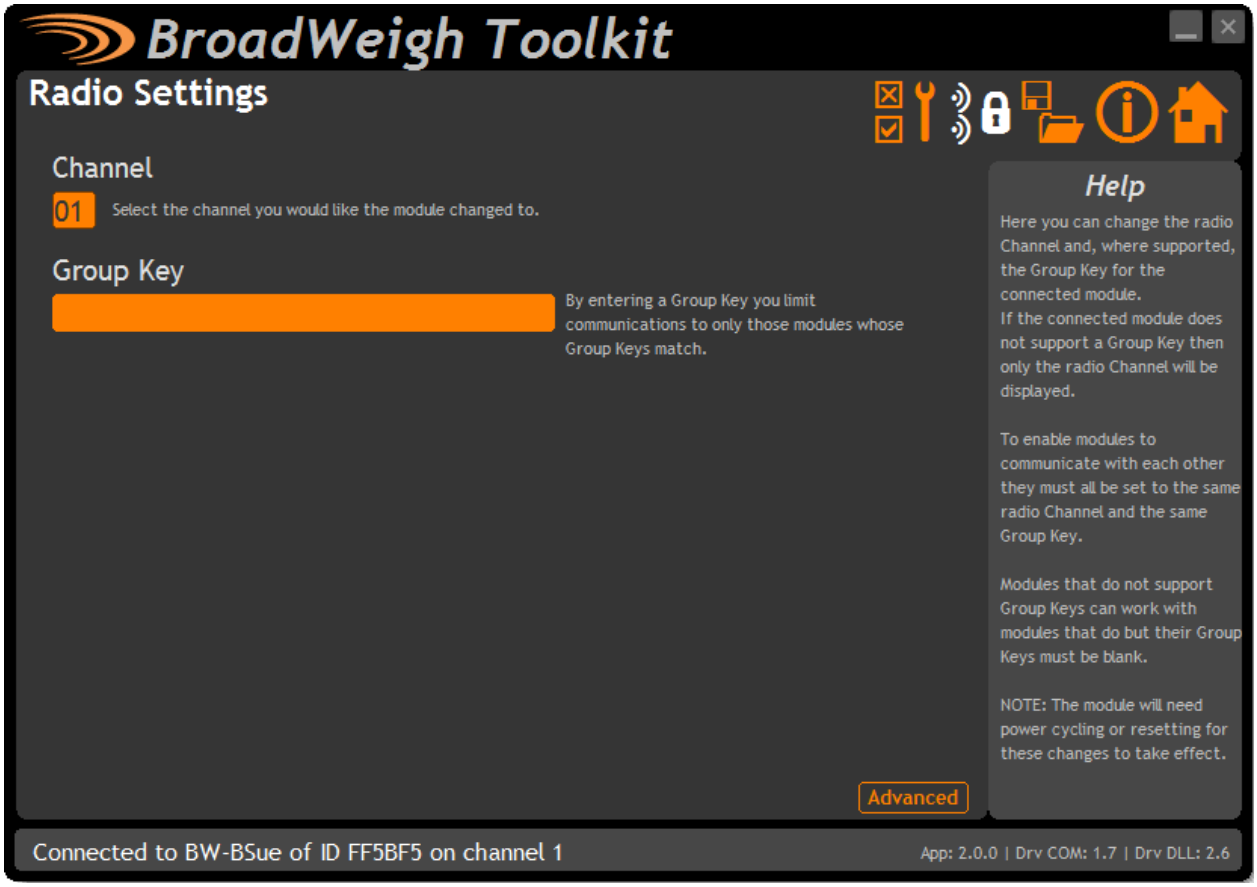
Home

BroadWeigh Toolkit
Home
Monitor or Log
You can view and log the data being transmitted from an acquisition module or view the spectrum analyser by clicking the icons above right. Pairing is NOT required to log data from your device.
Configure your device
To configure your module we need to temporarily pair to it. When we pair from the Toolkit we configure the base station radio settings to match the remote module.
To pair you must:
· Remove the power from your module.
· Initiate the pair by clicking the button below.
· Re-apply the power to the module.
When applying power be careful to do this cleanly because if the module is powered up with an intermittent connection it may reset during pairing and result in poor or no communications.
Pair
If the module cannot be paired because access to the power supply is either not possible or many modules share the same power supply. Click Here for manual connection.
Help
This Home page is where you begin your connection to your module.
You must be able to access its power supply so you can remove and reapply it.
The module you want to connect to must be the only module you re-apply power to.
When pairing to a module the base station radio settings are changed to match those of the remote module.
[To connect to the base station hold the Shift key while clicking the Pair button]
Connected to Base Station of ID FF8C80 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

You now have successful communications with the base station so you can now let the Toolkit know you want to configure the base station and **not** a remote module.

> To connect to and configure the connected base station, hold the **shift key** and click the **Pair** button.

Radio Settings


BroadWeigh Toolkit
Radio Settings
Channel
01
Select the channel you would like the module changed to.
Group Key
By entering a Group Key you limit communications to only those modules whose Group Keys match.
Help
Here you can change the radio Channel and, where supported, the Group Key for the connected module.
If the connected module does not support a Group Key then only the radio Channel will be displayed.
To enable modules to communicate with each other they must all be set to the same radio Channel and the same Group Key.
Modules that do not support Group Keys can work with modules that do but their Group Keys must be blank.
NOTE: The module will need power cycling or resetting for these changes to take effect.
Advanced
Connected to BW-BSue of ID FF5BF5 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change the channel and group key for the base station.

Items you can change:

Channel	Select a channel between 1 and 15. The default is channel 1. You can use the Spectrum Analyser mode to determine a good clean channel to use.
Group Key	**This section will only be visible if the version of the base station supports Group keys.** Only modules with identical group keys can communicate. You can isolate groups of modules on the same channel or just use the key to ensure the data cannot be read by somebody else. **To use modules that support Group Keys with older modules that do not then then the Group Keys must be blank.**
Advanced	See Radio Settings Advanced next

Advanced Settings

BroadWeigh Toolkit
Advanced Settings
Waker Duration (ms)
12000
Select how long the handheld will wait to wake the paired device. The default is 12 seconds (12000 mS).
Help
These are advanced settings and do not normally require changing.
Connected to BW-BSue of ID FF5BF5 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

You should not normally need to change these settings.

Items you can change:

Waker Duration	When you send a wake command to a BroadWeigh module via the base station the duration of this wake attempt is controlled by this setting. Enter the desired duration in milliseconds.

Enclosure & Mounting

This module is fitted inside our medium, 'ACMi' ABS enclosure. Please see Appendix A – Enclosures & Mounting – ACMi for more information.

Antennas

These modules have the antenna already fitted inside the enclosure so there are no specific mounting requirements.

Specification

Parameter	Minimum	Typical	Maximum	Units	Notes
USB Supply Range	4.875	5	5.125	Vdc	As defined by USB 2.0 Specification
USB Bus Powered Operational Current	-	100	-	mA	
Operating Temperature Range	-20	-	55	°C	
Storage Temperature Range	-40	-	85	°C	
Environmental Protection			IP67		Does not apply to USB connector at cable end.

Radio Range

To determine radio range please refer to Appendix B – Radio Range

BW-AR

Overview

The BW-AR is an active repeater which will allow the BroadWeigh range of modules to divert around obstacles or increase range or coverage.
The connectivity module provides a battery holder for a pair of alkaline 'D' cells and has regulator circuitry for an external power supply. The batteries can also be used to provide power in case of external supply failure.
The case is environmentally sealed to IP67.

The repeater will allow messages to be repeated once which could double the radio range under ideal conditions. Adding more repeaters will not increase range but can increase coverage.

Order Codes

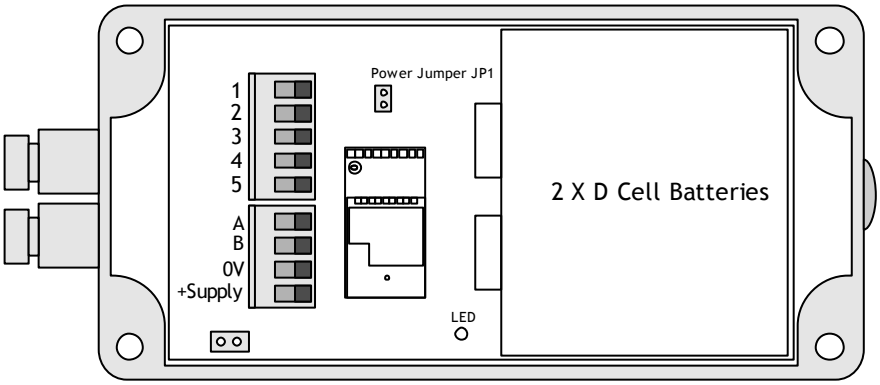
BW-AR

Active Repeater module mounted in large weatherproof enclosure with battery holder for two D cell alkaline batteries. Also has ability to be powered from external supply voltage.

Connections

Power

Power can be supplied by fitting two 'D' cell alkaline 1.5 V batteries or the module can be supplied from an external 5 Vdc to 18 Vdc source. The module will switch to the external supply in preference providing a battery backup.
In both cases the JP1 power jumper needs to be fitted to supply power to the module.
When powered from the external DC source the LED will illuminate.



Power Options

The BW-AR can operate permanently powered from a 5-18 Vdc source or can operate from on-board batteries.

Permanently Powered

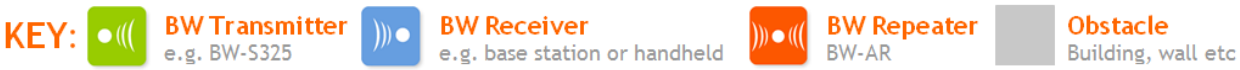
This is the simplest way to operate the repeater. With a permanent supply you do not need to worry about the repeater sleeping or waking. You can optionally choose whether the repeater always wakes sleeping modules and then you could utilise the powering up of the repeater to wake up those modules outside the normal radio range.

Battery Powered

In low power battery mode the repeater wakes from sleep when other modules are woken and will remain awake until it stops receiving Stay Awake messages. This will work transparently with most BroadWeigh instrumentation. You just need to decide on the Sleep Delay for a battery powered repeater. This causes the repeater to enter sleep mode if it does not receive stay awake messages within the Sleep Delay time.
Stay awake messages are transmitted by handhelds, analogue output modules and PC software etc. so that when those items are turned off or disabled all other BroadWeigh modules will sleep when their Sleep Delay time elapses.

Getting Started

Use the BroadWeigh Toolkit to ensure that the repeater radio channel matches the rest of the BroadWeigh modules. You will then need to decide whether the repeater is battery powered or permanently externally powered and whether it should always wake other sleeping modules when it is powered up and awake.



Increase Range

With No Repeater

With Repeater

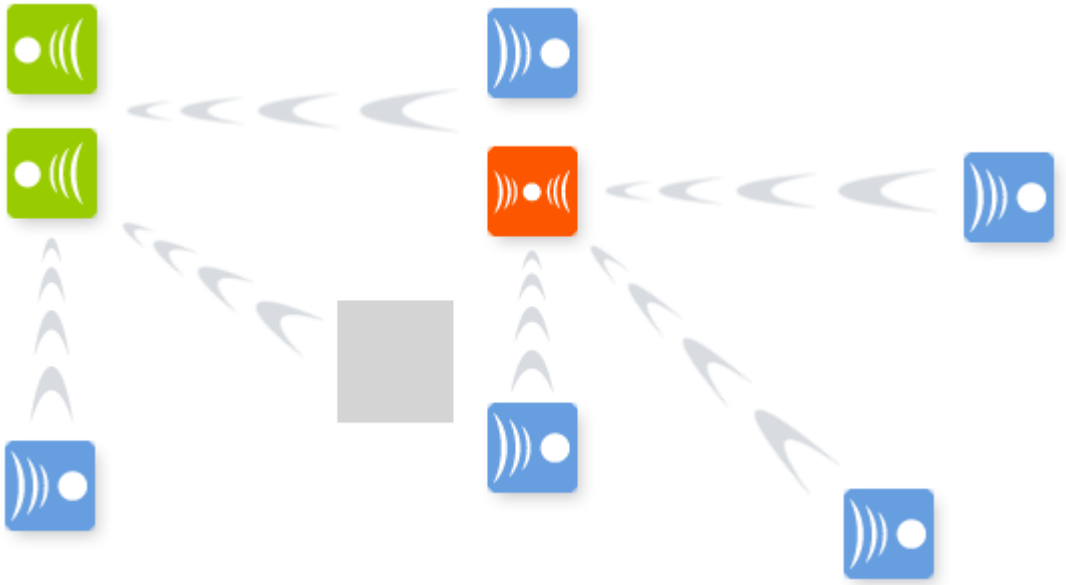
Span Obstacles

With No Repeater

With Repeater

Combined Solutions

Many Receivers



Many Transmitters

Considerations

- Each repeater can effectively double the amount of traffic transmitted. Be careful not to introduce too many repeaters that are within range of each other as there may be un-necessary duplication of radio traffic. Carefully plan the layout of radio modules to minimise this.
  Using the Data Provider monitor in the BroadWeigh Toolkit can show the amount of traffic. The BroadWeigh Toolkit on a laptop or netbook is ideal for checking installations as it is mobile so traffic can be monitored at different points in the installation.

- A repeater will not repeat a packet that has already been repeated. Hence there is only one extra 'hop' introduced and a maximum doubling of the radio range.

- When waking remote modules separated by a repeater and that repeater is asleep it may take twice as long to wake a module as when no repeater is involved.

- If the repeater is to be battery powered use the same Sleep Delay as is suitable for the transmitter modules in the system.

- You cannot pair to a module through a repeater. Using the BroadWeigh Toolkit it **may** be possible to configure module through a repeater by soft pairing. The results will vary depending on the number of repeaters and amount of radio traffic. In some cases it may be necessary to power down repeaters when configuring modules.

- Most receiver modules and software issue a broadcast wake when turned on or activated and this will also wake a sleeping repeater which will then proceed to wake those modules within its range..

Configuration

The BroadWeigh Toolkit provides a means of simple configuration and calibration of the transmitter module along with useful tools to aid integration.

Launch the BroadWeigh Toolkit software application and pair to this module to enable the connection to the Toolkit to allow configuration to take place. See Common Toolkit Pages - Home

Settings

BroadWeigh Toolkit
Settings
Always Wake
No
When set to YES the repeater will wakeup all sleeping modules whenever they are detected.
Sleep Delay (s)
0
Only set this if you want the repeater to operate on battery power and enter deep sleep itself. Enter a time in seconds after which without receiving a 'Keep Awake' message the device will enter deep sleep. The repeater will wake again when it sees a wakup command to ANY module.
Battery Low Level
2.20
Set the battery voltage below which the repeater will indicate that its battery is low by making all repeated modules report battery low. If the repeater is externally powered then it will be OK to leave at the default of 2.2V. If you are using batteries but wish to disable this feature select 2.0V
Repeater Subgroup
0
Select subgroup 0 - 3. A repeater will repeat data from all T24 modules (with the same radio settings) that it receives data from where the module repeater subgroup is set to zero or matches the repeater subgroup set here in the repeater.
Help
These are advanced settings and do not normally require changing.
Connected to BW-AR of ID FF6078 on channel 1
App: 2.0.0 | Drv COM: 1.7 | Drv DLL: 2.6

Here you can change the settings for the repeater.

Items you can change:

Always Wake	In some cases where the repeater is manually powered on and off you may want it to wake all sleeping modules within its range. Set this option to Yes to enable this. The modules you wake should have their own Sleep Delay settings set so they go back to sleep after stopping receiving Stay Awake messages from the data consumer (PC or handheld).
Sleep Delay	If the repeater is to be battery powered and you want to operate in low power mode you can employ this delay. Once the repeater stops hearing Stay Awake messages from the data consumer (PC or handheld etc.) it will go to sleep after this amount of time. The repeater will wake when any other module is woken. Set to zero to disable.

Battery Low Level	Select the battery voltage below which the repeater will report a low battery. It does this by making all repeated modules report a low battery so the data consumer (a handheld or PC software etc.) will be able to detect a problem. The battery level applies to the voltage seen after 3 V regulation. The default is 2.2 V and can be left at this when the repeater is powered externally. If the repeater is battery powered and you wish to disable this feature select 2.0 V

Enclosure & Mounting

This module is fitted inside our large, 'ACM' ABS enclosure. Please see Appendix A – Enclosures & Mounting – ACM for more information.

Antennas

These modules have the antenna already fitted inside the enclosure so there are no specific mounting requirements.

Radio Range

To determine radio range please refer to Appendix B – Radio Range

Specification

Environmental	Min	Typical	Max	Units
Operating temperature range	-40		+85**	°C
Storage temperature	-40		+85	°C
Humidity	0		95	%RH
Environmental protection with suitable cables exiting through cable glands.		IP67		

**Batteries used may have reduced operating temperature range.

Power Supply	Min	Typical	Max	Units
Standby / Low power mode		5	20	µA
Normal Mode on constantly		55	60	mA
Reverse Polarity Protection		-32		Vdc
Internal				
Battery Supply Voltage	2.1	3	3.6	Vdc
External				
Power Supply voltage	5		18	Vdc
Power Supply ripple			50	mV ac pk-pk

Battery Life	Typical	Units
Battery life using Duracell LR20 'D' cells with the T24-AR permanently activated. **	228 (10)	Hours (Days)

**Usually using batteries the BW-AR would be utilising the SleepDelay to return to sleep. Therefore the actual daily usage would allow for far greater than the stated battery life. For example: If the T24-AR was used for 1 hour per day then the battery life would be 6840 hours or 288 days or nearly 10 months.

Radio Range

To determine radio range please refer to Appendix B – Radio Range

Power Supply Modules

PP1 & SP1

Overview

The Power Pack (PP1) & Solar Panel 1 (SP1) provides dependable off-grid power generation and storage to support a variety of products.

Packaged in an IP67 sealed case with rugged waterproof connectors the PP1 has two sources of charge for the internal battery with both solar and mains power input charging. The case also features Stainless steel padlock protectors for easily securing your supply on site.

The PP1 has a single 12 V fuse protected output. The mating connector comes pre-fitted with 5 metres of cable and bare end connections.

The solar panel features hail-proof tempered glass and closely packed polycrystalline cells, sealed into a robust aluminium frame. The junction box on the rear of the panel does not protrude beyond the frame, so installation can be simple and neat. The solar cell comes with 5 metres of cable as standard.

The SP1 & PP1 combined are designed to provide a perpetual power supply for a 12 V system drawing an average of 53 mA, even during winter.

The PP1 can also be used as a mains powered 12 Vdc supply with 33 Ah battery backup.

Order Codes

PP1

Power pack 1 housed in robust weatherproof case.

SP1

Solar panel with cable suitable for connection to PP1

Getting Started

It is important when using the PP1 in any configuration that the connections are made in the following order:

1. Connect the 12 V output lead to the device you wish to supply. The PP1 is provided with a 5 metre 12 V output cable, this cable has the IP67 connector which mates with connection 3, see below. The cable is bare end terminated the red wire is positive and black is ground. Ensure the bare end connections are made before attaching to the PP1.
2. Connect the Solar Panel. The solar panel is supplied with a 5 m cable terminated with the IP67 connector which mates with connection 1, see below.
3. Connect 100-240 Vac supply (if necessary) The PP1 is supplied with a 0.8 m mains cable with a 13 A plug. The battery inside the PP1 will be supplied fully charged.

Power Pack 1 Connections

1. Solar Panel Input
2. 100 – 240 volt AC input
3. 12 volt DC Output
4. 6.3 amp Anti-surge Fuse

Installation

Connecting Power Pack 1

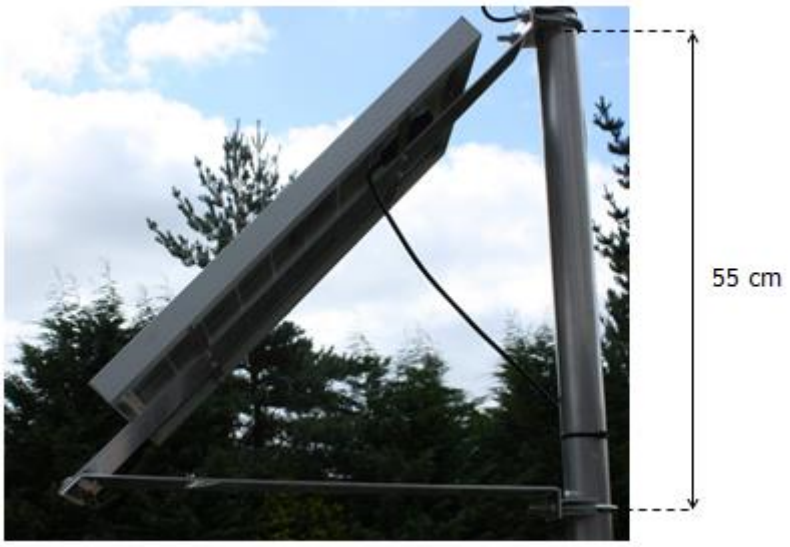
All connectors on the SP1 and PP1 are IP67 rated when correctly mated. The PP1 case is also IP67 rated meaning it is protected against the effects of temporary immersion in water between 15 cm and 1 m for no longer than 30 minutes. Dust caps must be fitted properly if the connection is not being used. If possible avoid positioning the PP1 in direct sunlight to limit temperature effects on the battery.
The connections for the solar panel input and 12 V output feature a locking collar to ensure the connection is sealed. To insert remove the dust cap and align the connector and insert; there is a locating ridge to ensure correct orientation. Once inserted, twist the collar clockwise to lock in place. The connectors for the solar panel and 12 V output are opposite gender preventing incorrect connections.

The PP1 110 - 240 Vac input has a sealing cap for when it is not connected to the mains. The sealing cap is removed by pushing the outer sleeve towards the case and pulling the cap out.

To insert the mains cable input simply align the two parts using the locating grooves on the connector and push in until the outer sleeve locks; to remove again repeat the same procedure as to remove the sealing cap.

Solar Panel Orientation

The SP1 is supplied on a mounting plate which when assembled with the horizontal support holds the panel at 50 degrees. The bracket is designed to be mounted on a pole or directly onto a wall.
For detailed panel angle information based on country and location see Solar Electricity Handbook calculator here: http://www.solarelectricityhandbook.com/solar-angle-calculator.aspx



When positioning the solar panel it should always face true south if you are in the northern hemisphere, or true north if you are in the southern hemisphere. True north is not the same as magnetic north. If you are using a compass to orient your panels, you need to correct for the difference, which varies with location. Search the web for "magnetic declination" to find the correction for your location.

Also consider where shadows may fall on the solar panel, the panel needs maximum exposure to the sun to operate as specified.

Operation

The PP1 and SP1 combination was designed to supply a 12 V system with a maximum continuous average current consumption of 53 mA. The power rating of the system would be 0.636 W; if used 24 hours per day this would equate to 15.264 watt-hours. On an average British day, this power could be produced by a solar panel array of approximately 6 watts. However, you do of course get more power in the middle of summer than in winter. In summer you could produce that power required with only 3 watts of solar panels. In winter you would need 15 watts of panels to produce enough power. Hence the SP1 20 W panel is more than adequate.

The output from the PP1 is fuse protected by a 6.3 A anti surge fuse, this is to protect against short circuit on the output, fuses are 6.3 A 20x5 mm ceramic glass tube type. The 100-240 Vac input charger is fuse protected in the 13 amp plug, if this plug is replaced with any other connector please consider how your PP1 is protected.

Dimensions & Weight

PP1 Dimensions	339 x 295 x 152 mm
PP1 Case materials	Polypropylene
PP1 Weight	13 kg
SP1 Dimensions	360 x 510 x 28 mm
SP1 Frame Material	Aluminium
SP1 Weight	3 kg

PP1

SP1

Specifications

Electrical	Min	Typical	Max	Units
Output Voltage		12		Vdc
Internal Capacity		33		Ah
External Power Supply Voltage	100	-	250	Vac
Input Frequency	47	-	63	Hz

Cable Lengths				
12 V Output Cable to Bare End		5		m
Solar Panel to Power Pack		5		m
Mains Charging cable *		0.8		m

* Supplied with 13 Amp Plug

Environmental				
IP rating		IP67		
Operating temperature range **	-20		+50	°C
Storage temperature	-20		+50	°C
Humidity	0		95	%RH

** When being charged from Mains min operating temperature 0 °C max operating temperature is 40 °C

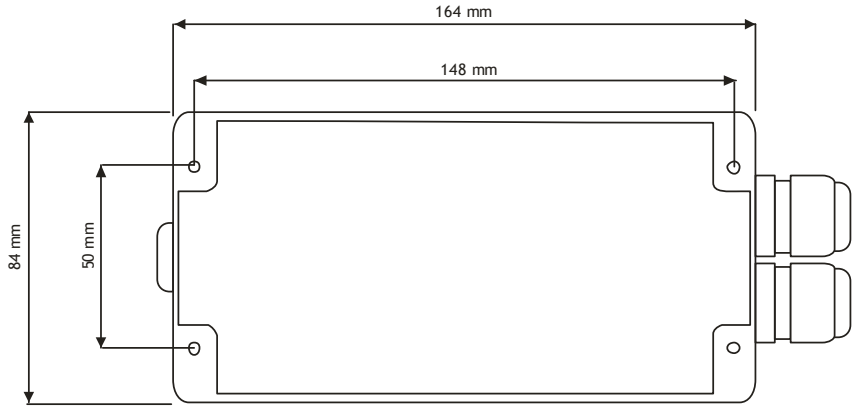
Appendices

Appendix A - Enclosures

ACM Type

Dimensions

This ABS enclosure measures 164mm X 84mm and 57mm deep. There are three positions for cable glands; two at one end and one at the other. Different modules may have a different number of glands fitted.



Opening the Case

The case lid is secured with 4 x ¼ turn quick release screws. Using a flat head or Phillips screwdriver push down and turn each screw by 90° anticlockwise to release.

Mounting Information

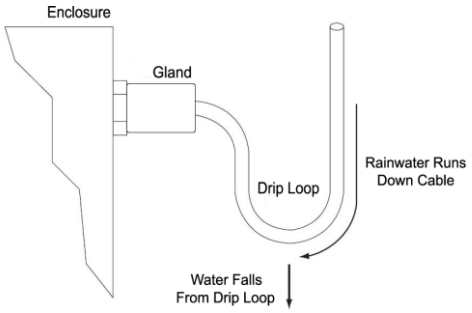
This enclosure is designed to be mounted to a surface. It is secured by holes on a 148 mm X 50 mm rectangle. The mounting holes are accessible once the lid has been removed and these are outside the sealing mechanism. Mounting holes have a diameter of 4.1 mm and can accommodate a screw head diameter of 6.8 mm.

Antenna Position

The module is fitted with a BW-ANTA antenna which is mounted on the inside of the long side of the base on the opposite side of the enclosure to the metallised polyester label visible on the outside.

Environmental Protection

The case is environmentally sealed to IP67 and the glands sealed to IP67 when cables of the correct diameter have been used.
The cable diameter can range from 4mm to 8mm. Cables of a smaller diameter may be used if sleeved to increase their diameter.
When mounting the enclosure outside the cables should be dressed to provide a drip loop.



The sealing gasket resides in the lid. Be careful when replacing the lid that there are no dirt particles on the lower case lip or in the lid gasket channel as this may reduce the sealing capability.

ACMi Type

Dimensions

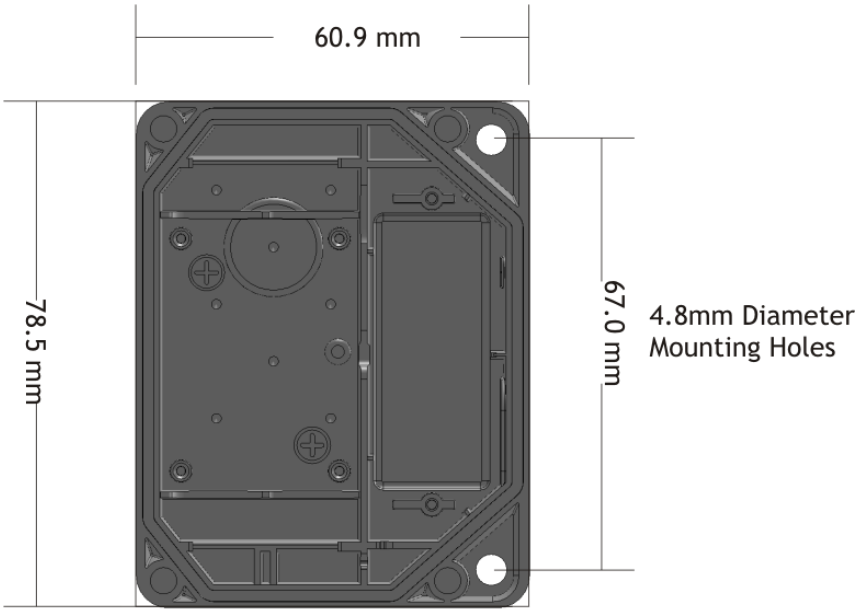
This enclosure is 76.6 mm X 59 mm and 31 mm deep. The gland extends a further 25 mm from one long side.

Opening the Case

The case lid is secured with 4 x #2 cross head screws, remove the four screws and apply pressure in either off set corner fixing to lift lid.

Mounting Information

The enclosure has two mounting holes as shown below; these mounting holes are external to the seal but still covered by the case lid to offer fixings for some environmental protection. In addition mountings can be made through the back of the case however a seal or gasket must be used to maintain environmental protection.



Antenna Position

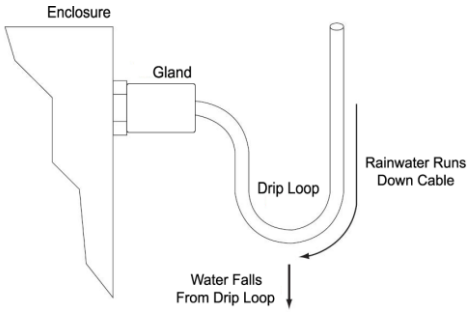
This enclosure is fitted with a PCB antenna which sits over the wiring access chamber and is covered by the enclosure lid.

Environmental Protection

The case is environmentally sealed to IP67.

The sealing gasket resides in the base. Be careful when replacing the lid that there are no dirt particles on the gasket channel or lid as this may reduce the sealing capability.

When mounting the enclosure outside the cables should be dressed to provide a drip loop.

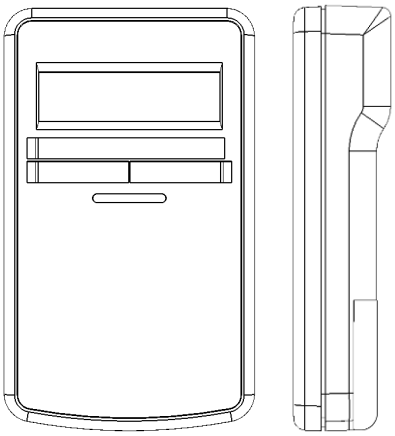


The sealing gasket resides in the base. Be careful when replacing the lid that there are no dirt particles on the lid lip or in the case gasket channel as this may reduce the sealing capability.

Handheld Type

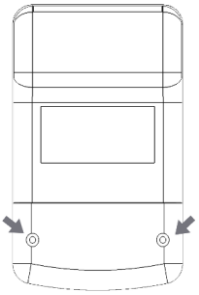
Dimensions

This ABS handheld case is 152 mm X 90 mm and 34 mm deep at its highest section.

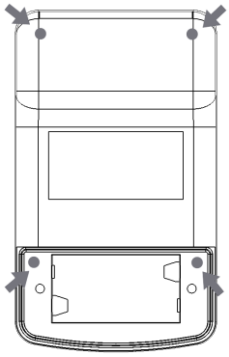


Opening the Case

The battery compartment is secured with two Philips head screws.



Once the battery compartment has been removed this gives access to two further screws which can be removed (along with the two at the top end) to allow the entire case to come apart. This gives access to the legend channels where cardboard legends can be slipped in behind the transparent label windows where supported. Note that the top two screws will have rubber 'O' rings on them. These rings are an integral part of the sealing mechanism.



When the case comes apart be careful of any wires running between the two case halves.

Mounting Information

There are no mounting options on the handheld enclosure.

Antenna Position

The enclosure is fitted with a BW-ANTA antenna which is mounted in the top end of the enclosure.

Environmental Protection

The enclosure is sealed to IP67. Ensure gaskets and mating parts are free from dirt and debris when re-assembling.

Appendix B – Radio Range

Overview

Radio performance at microwave wavelengths is very dependent upon the operating environment; any structure within the operating region of the radios will give rise to three effects:

Obscuration. Obscuration will result in reduced range and occurs when an obstruction masks the line-of-sight between radios.

Aberrations to the horizontal and vertical space patterns. Distortion of these patterns may occur if structures or objects are placed in the near or intermediate field of the antenna. The effect will be to distort the coverage patterns, adversely affecting range and link quality.

Reflection. Any object placed in line-of-sight of the transmit antenna will result in signals arriving at the receiver by an indirect path. Degradation of performance due to reflection (multipath effects) appears as reduced range or poor link quality.

Any of the above will cause poor RSSI figures, an increase in the packet loss rate and in extreme cases complete loss of signal. Fortunately, if consideration is given to these effects at the integration stage then a good quality link will be obtained.

Guidelines for installation:
When planning installations ensure that line-of–sight between nodes is maintained and that objects or structures are kept at least one metre away from antennae wherever possible.

Range

Radio range has been measured as 800 m line of sight in an open field site where the transmitter was 3 m from the ground and the receiver was 1.5 m from the ground.
This range will be reduced when transmitters or receivers are close to metallic structures or close to the ground. Walls and floors will also reduce the achievable range in indoor environments.

Modules manufactured before July 2015 have a range of 200 m.

Appendix C - Radio Specification

The following specification applies to all BroadWeigh modules.

	Min	Typical	Max	Units
License		License Exempt		
Modulation method		MS (QPSK)		
Radio type		Transceiver (2 way)		
Data rate		250		k bits/sec
Radio Frequency	2.4000		2.4835	GHz
Power		10		mW
Channels (DSSS)		15		

For radio range information See Appendix B – Antenna Range

Appendix D – Intentionally Empty

Appendix E – Approval Statements

CE

Complies with EMC directive. 2004/108/EC
The Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive, 1999/5/EC,

European Community, Switzerland, Norway, Iceland, and Liechtenstein

English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive
Deutsch:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 1999/5/EU.
Dansk:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Directiv 1999/5/EF.
Español:	Este equipo cumple con los requisitos esenciales asi como con otras disposiciones de la Directive 1999/5/EC.
Français:	Cet appareil est conforme aux exigencies essentialles et aux autres dispositions pertinantes de la Directive 1999/5/EC.
Íslenska:	Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.
Italiano:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.
Nederlands:	Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.
Norsk:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-directiv 1999/5/EC.
Português:	Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.
Suomalainen:	Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.
Svenska:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Manufactured in the UK by: Mantracourt Electronics Ltd, The Drive, Farringdon, Exeter, Devon, EX5 2JB, UK

IC

Industry Canada Industrie Canada

IC:7224A-RA24

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter RA24 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna	Gain (dBi)	Antenna Type	Manufacturer/Vendor
Ant A	3	Inverted F	Mantracourt
Ant C	2.2	½ wave Dipole	Mantracourt
Integrated	1.3	Chip antenna	Mantracourt

To comply with Industry Canada RF radiation exposure limits for general population, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 5 cm is maintained between the radiator (antenna) and all persons at all times and must not be co-located or operating in conjunction with any other antenna or transmitter.

Manufactured in the UK by: Mantracourt Electronics Ltd, The Drive, Farringdon, Exeter, Devon, EX5 2JB, UK

FCC

Family: RA24
Models: i and e

FCC ID:VHARA24

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

For use with antennas: integrated, T24-ANTA, T24-ANTB, T24-ANTC, T24-ANTD, T24-ANTE antennas and those listed in the table below.

Manufacturer Code	Description	Gain	Available From
DELTA7A	Dual band 2.4 or 5.8GHz Hinged mount whip	2.1dBi	Sequoia
DELTA14	Stubby WiFi / WLAN Antenna	2.0dBi	Sequoia
DELTA15/SMAM/RA/RP11	2.4GHz Right angle RPSMA	2.0dBi	Sequoia
1699481	AUREL ANT.RP SMA 2.4GHz	2.0dBi	Farnell Electronic Components
537-785	EAD, FBKR35068-RS-KR WiFi Antenna	2.0dBi	RS Components

Manufactured in the UK by: Mantracourt Electronics Ltd, The Drive, Farringdon, Exeter, Devon, EX5 2JB, UK

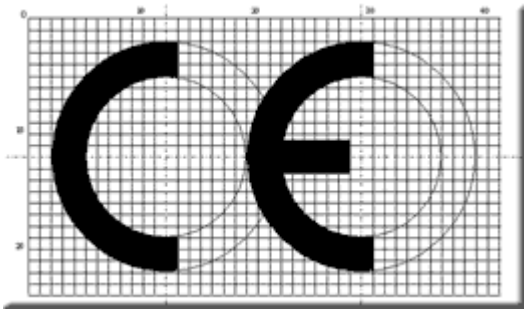
Appendix F - OEM / Reseller Marking and Documentation Requirements

CE

The T24 series has been certified for several European countries.
If the transmitter module is incorporated into a product, the manufacturer must ensure compliance of the final product to the European harmonized EMC and low-voltage/safety standards. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive. Furthermore, the manufacturer must maintain a copy of the T24 device user manual documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

OEM Labelling Requirements
The 'CE' marking must be affixed to a visible location on the OEM product.

The CE mark shall consist of the initials "CE" taking the following form:



- If the CE marking is reduced or enlarged, the proportions given in the above drawing must be respected.
- The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
- The CE marking must be affixed visibly, legibly, and indelibly.

IC

The RA24 Module has been certified for integration into products only by OEM integrators under the following conditions:

1. The antenna(s) must be installed such that a minimum separation distance of 5cm is maintained between the radiator (antenna) and all persons at all times.
2. The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter.

As long as the two conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for certain configurations or co-location with another transmitter), then Industry Canada certification is no longer considered valid and the IC Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Industry Canada authorization.

End Product Labelling

The RA24 Module is labelled with its own IC Certification Number. If the IC Certification Number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labelled in a visible area with the following:

Contains Model RA24 Radio (2.4 GHz), IC:7224A-RA24

The OEM of the RA24 Module must only use the approved antenna(s) listed above, which have been certified with this module.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user's manual of the end product.

The user's manual for the end product must include the following information in a prominent location:

"To comply with Industry Canada RF radiation exposure limits for general population, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 5 cm is maintained between the radiator (antenna) and all persons at all times and must not be co-located or operating in conjunction with any other antenna or transmitter."

FCC

The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents as shown:

Contains FCC ID:VHARA24

- This device complies with Part 15 of the FCC Rules.
  Operation is subject to the following two conditions:
  (1) This device may not cause harmful interference, and
  (2) This device must accept any interference received, including interference that may cause undesired operation.

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

When integrated in OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas other than T24-ANTA, T24-ANTB, T24-ANTC, T24-ANTD, T24-ANTE and those listed below, must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

Manufacturer Code	Description	Gain	Available From
DELTA7A	Dual band 2.4 or 5.8GHz Hinged mount whip	2.1dBi	Sequoia
DELTA14	Stubby WiFi / WLAN Antenna	2.0dBi	Sequoia
DELTA15/SMAM/RA/RP11	2.4GHz Right angle RPSMA	2.0dBi	Sequoia
1699481	AUREL ANT.RP SMA 2.4GHz	2.0dBi	Farnell Electronic Components
537-785	EAD, FBKR35068-RS-KR WiFi Antenna	2.0dBi	RS Components

Transmitter modules have been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Changes or modifications not expressly approved by Mantracourt could void the user's authority to operate the equipment.

In order to fulfil the certification requirements, the OEM must comply with FCC regulations:

1. The system integrator must ensure that the text on the external label provided with this device is placed on the outside of the final product.

2. The transmitter modules with external antennas may be used only with Approved Antennas that have been tested by Mantracourt.

Appendix G - Worldwide Regional Approvals

Region	Product Conforms To
Europe	CE
USA	FCC
Canada	IC

Important Note

Mantracourt does not list the entire set of standards that must be met for each country. Mantracourt customers assume full responsibility for learning and meeting the required guidelines for each country in their distribution market.

For more information relating to European compliance of an OEM product incorporating the T24 or BroadWeigh range of modules, contact Mantracourt, or refer to the following web site: **www.ero.dk**

Declaration of Conformity

We,
Mantracourt Electronics Ltd
The Drive
Farringdon
Exeter
Devon
EX5 2JB
+44 1395 232020

declare under our sole responsibility that our products in the **BroadWeigh Radio Telemetry Product Range** to which this declaration relates conform to the essential requirements and other related requirements of the following directives:

The **R&TTE Directive 1999/05/EC**

The **RoHS Directive 2011/65/EU**

The **LV Directive 2006/95/EC**

Date: **June 2015**

Signed:

Brett James
Development Manager
Mantracourt Electronics Limited.

mantracourt
Advanced Intelligent Instrumentation

FCC ID: VHARA24 IC:7224A-RA24

Appendix I - Warranty

Warranty

All Telemetry products from Mantracourt Electronics Ltd., ('Mantracourt') are warranted against defective material and workmanship for a period of one (1) year from the date of dispatch.

If the 'Mantracourt' product you purchase appears to have a defect in material or workmanship or fails during normal use within the period, please contact your Distributor, who will assist you in resolving the problem. If it is necessary to return the product to 'Mantracourt' please include a note stating name, company, address, phone number and a detailed description of the problem. Also, please indicate if it is a warranty repair.

The sender is responsible for shipping charges, freight insurance and proper packaging to prevent breakage in transit.
'Mantracourt' warranty does not apply to defects resulting from action of the buyer such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorised modification.

No other warranties are expressed or implied. 'Mantracourt' specifically disclaims any implied warranties of merchantability or fitness for a specific purpose.
The remedies outlined above are the buyer's only remedies. 'Mantracourt' will not be liable for direct, indirect, special, incidental or consequential damages whether based on the contract, tort or other legal theory.

Any corrective maintenance required after the warranty period should be performed by 'Mantracourt' approved personnel only.

mantracourt
Advanced Intelligent Instrumentation

Document Title:	**BroadWeigh User Manual**
Applies To:	**BroadWeigh Product Range**
Part Number:	**517-927**
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Dated:	**19th October 2015**

In the interests of continued product development, Mantracourt Electronics Limited reserves the right to alter product specifications without prior notice.

www.mantracourt.com